

The Handicap of Deafness

1. It is extremely difficult, indeed it is well-nigh impossible, for the normal adult to appreciate the handicaps which are imposed on the child who has been deaf from birth or who has become deaf in the course of childhood. We try, in the sub-paragraphs below, to acquaint the reader with some of these handicaps.

(a) By an effort of imagination the *adult* can realise what it would mean to him if he were suddenly stricken with severe deafness. He would no longer hear the noises of everyday life, from the tinkle of his doorbell to the sounds of passing traffic ; he would lose the charm of bird-song, the entertainment of broadcast programmes and the glory of music ; he would be unable to participate in conversation since, although he could continue to use his acquired gift of speech (without hearing his own voice), he would not hear what others might say. The ability to read, whether for information or for pleasure, would remain with him, since he would not lose the language skills which he had already learned.

(b) The *child* who is born so deaf that he cannot hear speech in ordinary circumstances or who loses hearing to this degree at a very early age is in a drastically worse position ; he suffers all the handicaps of the adult but in addition loses the natural means of acquiring language. While the hearing child is able to heed the friendly talk and chatter which surrounds him and from which he gradually acquires understanding of the spoken word and develops the power of speech, the deaf child hears nothing and accordingly fails (unless very specially trained) to make the normal response to speech. He is not dumb in the sense that his vocal mechanism cannot work, but he cannot imitate words as he has never heard them ; he has lost the natural foundation on which all language learning normally depends.

(c) Closely allied to the point just made is another, equally fundamental and possibly more tragic. If we have never heard, the sound of words cannot run in our minds ; we cannot have "inner speech", which is the normal and natural vehicle for much of our thinking. When we pause to examine the matter, e.g., how we plan the purchase of a new coat or the writing of a letter, we find that we really formulate our plan by thinking in words spoken inwardly. The close connection between inner speech and thinking shows itself in our language : we often use the phrase "*I said to myself*" as a synonym for "*I thought*". Thus, by depriving the child of inner speech, deafness denies him an important instrument of thought.

(d) The deaf child (or deaf person), though deprived of hearing, nevertheless has all the normal impulses. He has the same need as others to communicate, yet suffers a frustrating barrier which he himself fails to understand. It would not be surprising therefore if, deep down within him, there were nagging frustrations of which he is hardly aware but which may nevertheless lead to a disturbed or unfulfilled emotional and social life.

(e) We have much in common with the lower animals : we exercise ; we sleep ; we breathe ; we eat ; we digest ; we have our pleasures or we suffer pain. One of the chief characteristics which distinguishes us from the animals is

our ability to develop language. When, therefore, deafness deprives a child of this, it has struck at the very roots of his humanity. It must not be assumed from this that we believe the deaf child to be sub-human or incapable of thought. He has lost, however, the natural means by which he manifests his most human characteristic—speech; and he has lost a normally important vehicle of thought. There is no doubt that he develops substitutes, but it is not at all easy for the normal adult to understand how these substitutes work or what is the exact nature of a deaf person's mental life.

2. (a) From what has been said in the last paragraph, it is clear that the education of the child who has been severely deaf all his life should consist not only of education as it is normally understood but also (more fundamentally) of giving him language. It is the aim of his teachers to give him this, not only by training him to interpret whatever range of sounds he may be made to hear through amplification but also by teaching him to interpret lip-movements and other facial expressions ("speech-reading", more commonly referred to as "lip-reading").

(b) As has just been indicated, where the child has some hearing, however slight, it is the aim of the school to use instruments, such as amplifiers and hearing aids, to help him to acquire language by sound, or to supply auditory clues to reinforce lip-reading.

(c) Where a child, before the onset of very serious deafness, has been able to develop language at least to some degree, his teachers should, and normally do, endeavour to make full use of this acquired language as the basis of further language development.

(d) While all babies vocalise, it is only children with good hearing who pay particular attention to the sounds of speech. Normal babies begin to make their earliest efforts to imitate speech when only a few months old, are often saying words by one year and usually attain quite a range of speech by the age of three or four years. Acquisition of language in these early years is so wonderful and so rapid that it seems as if nature had specially equipped the normal baby for the task. We consider by analogy—and in this we are strongly supported by our witnesses—that the early processes of language acquisition by the deaf must similarly be begun long before the normal school entrance age of five years, if full advantage is to be taken of these early impulses to communicate.

3. From the broad analysis above, we make the following three general *recommendations*, perhaps the most important of all our recommendations:

(a) Arrangements for the diagnosis of deafness or partial deafness in children should be more widespread, more thorough and more systematic than they have been.

(b) While we recognise that cases of delay in the diagnosis of deafness are much less common than they used to be, even only ten years ago, every effort should be made to effect diagnosis at an early age. We believe that authorities should be able to discover severe hearing defects in babies between six and twelve months old.

(c) Advantage should then be taken of early diagnosis to utilise the period when children seem to have a natural aptitude for the acquisition of language.

In making these recommendations we wish to emphasise, in the light of what is said above, that failure to diagnose severe hearing defect at as early an age as possible may be a tragedy for the individual which is difficult to exaggerate.

General Considerations

Diagnosis and Ascertainment

4. At an early stage of our deliberations we considered it necessary to clear our minds regarding the precise meanings to be ascribed to the words " diagnosis " and " ascertainment ", especially as the second of these occurs in our remit and is used in the Education (Scotland) Acts.

5. When a child is suspected of deafness, however slight, his hearing should be subjected to careful examination in order to diagnose what, if anything, is wrong; and, if his hearing is defective, the extent and nature of the loss should be determined as accurately as possible. The hearing loss may be in one ear or in both ; it may apply to sounds of all kinds, whether of high or low pitch, or it may apply particularly to sounds at one part of the frequency scale. The cause of the deafness (see Appendix II) and the age at which it first occurred should, if possible, be discovered. The otologists or other experts concerned in this work will consider whether the defect is remediable and whether the child should be given a hearing aid. All this investigation, largely medical in character, may be regarded as a diagnosis of the hearing condition—an *otological diagnosis*.

6. If a child is found to have a hearing defect, it is important that he should be examined from other points of view in order to determine whether his hearing defect is associated with any other physical defect ; whether his intelligence is average, above-average or below-average ; and the nature of his temperamental characteristics, such as his qualities of persistence. His environmental history and home circumstances should also be taken into account. This *general examination* should, in short, cover physical, psychological and social features.

7. *Ascertainment* is not an examination ; it is a decision for a particular educational purpose. In terms of the Education (Scotland) Act 1962, education authorities have a duty to ensure that children who appear to them to require special educational treatment (i.e., education by special methods appropriate to the special requirements of pupils who suffer from some disability) shall receive it. They are obliged, therefore, to ascertain which children in their area who have attained the age of five years require special educational treatment. For that purpose they may require a child of school age to be medically examined. Further, they must provide for the medical examination, if the parent so requests, of any child who has attained the age of two years. Before deciding whether a child needs special educational treatment the education authority must consider the advice given in consequence of any such medical examination and any other reports or information which it may obtain from teachers or other persons with respect to the ability and aptitude of the child. For the child with defective hearing, the decision (ascertainment) will depend upon the otological diagnosis and upon the findings of the more general examination, indeed upon the whole diagnostic *profile* of the child. It will thus be based upon the findings, and be the recommendation, of an expert team (which will be referred to later as the " ascertainment

team ") but in a legal sense "ascertainment" is the decision of the education authority itself.

8. It has been emphasised in the past (we refer particularly to the 1938 Report on "Children with Defective Hearing" and to the 1949 Report on "Pupils who are Defective in Hearing") that ascertainment for school purposes should not be based on otological diagnosis alone. We wish to add our emphatic *recommendation* to what is said in these Reports, namely that a pupil's mental ability and the extent to which he has acquired language are among the factors which should be most carefully considered alongside the degree of his hearing loss before he is "ascertained" for one type of education rather than another.

Classification or Grading

9. As a Committee we have been well aware of the value that has been, and is still, attached to the important 1938 Report on "Children with Defective Hearing". This Report emphasised that children should be ascertained—not on the basis of hearing loss alone—to belong to one or other of these educational grades:

GRADE I

Children with defective hearing who can, nevertheless, without special arrangements of any kind, obtain proper benefit from the education provided in an ordinary school—elementary, secondary or technical.

GRADE II

Children whose hearing is defective to such a degree that they require for their education special arrangements or facilities, but not the educational methods used for deaf children without naturally acquired speech or language. These facilities range from a favourable position in the ordinary school classroom to attendance at a special school. Two sub-divisions, Grades IIA and IIB, may be distinguished.

GRADE IIA

These children within Grade II who can make satisfactory progress in ordinary classes in ordinary schools provided they are given some help, whether by way of favourable positions in class, by individual hearing aids, or by tuition in lip-reading.

GRADE IIB

These children within Grade II who, even with the help of favourable positions in class, individual hearing aids or tuition in lip-reading, fail to make satisfactory progress in ordinary classes in ordinary schools.

GRADE III

Children whose hearing is so defective and whose speech and language are so little developed that they require education by methods used for deaf children without naturally acquired speech or language. This grade includes the totally deaf.

10. The Report endeavoured to relate these educational grades to hearing loss; for example, it stated that children in Grade III normally had a hearing loss of over 60 decibels as measured by a pure-tone audiometer. Like that earlier Com-

mittee itself, however, we doubt the wisdom of relating ascertainment too closely to hearing loss : the education for which a child is suited depends, and sometimes decisively depends, upon factors other than hearing loss and, therefore, while there is some considerable correlation between appropriate educational grading and degree of hearing loss, it would be quite unsound to attempt to relate the one too closely to the other. Some experts would go the length of claiming, not without good cause, that language development is a better single criterion for ascertainment and grading than is hearing loss. Further, ascertainment should not generally be regarded as a final decision ; the child's progress should be kept under review, and a decision to change his type of school should be taken if his language development is so good or so meagre that a change seems warranted, or if a change is desirable for some other cause.

11. The 1949 Report of the Advisory Council on Education in Scotland on " Pupils who are Defective in Hearing " accepted the grading system put forward in the English Report of 1938 (see paragraph 9 above) and drew special attention to the need, in ascertainment, to consider factors other than hearing loss, some of which indeed, such as language development, might be decisive.

12. In the Statutory Instrument defining types of children for whom special educational treatment is required (The Special Educational Treatment (Scotland) Regulations 1954), two groups of children suffering from hearing loss are distinguished, viz., the deaf and the partially deaf. These are defined as :

(a) deaf pupils, that is to say pupils who, because of defective hearing are without naturally acquired speech or language ;

(b) partially deaf pupils, that is to say pupils whose sense of hearing is defective but who possess naturally acquired speech or language.

13. The English Regulations (The Handicapped Pupils and Special Schools Amending Regulations 1962) correspond very closely to the Scottish Regulations referred to in the last paragraph. They differ, however, in one significant respect : they use the term " partially hearing " where the Scottish document uses the term " partially deaf ". Possibly there is no overwhelming advantage in one of these terms over the other, but we think that the English term, through the use of the word " hearing ", may help to emphasise the importance of making the utmost use, for educational purposes, of such hearing as the child may still have. For this reason we prefer it and *recommend* its use.

14. We ourselves have given the subject of grading much thought and have questioned a number of our witnesses about it. It is possible to argue that ascertainment must take into account so many factors (of which the child's hearing loss, language development, intelligence, qualities of persistence and home background are perhaps the most important) and that the children concerned differ so widely that each must be thought of as an individual and not simply placed approximately into an appropriate grade. It may further be argued that the persons concerned with ascertainment may be confronted in any particular case not with a neatly harmonious picture but with a profile which can scarcely be reduced to a final single assessment. While we consider that this is all true, we know that a decision must be made : the child has to be allocated to the educational course to which he seems best suited. The various feasible conclusions which may be reached are as follows :

- A. The child, despite some slight degree of hearing loss, may be regarded as fit, without special arrangements, for normal schooling in an ordinary school.
- B. The child is suffering from some degree of hearing loss but is fit for education in an ordinary school provided that he has the help of a hearing aid and/or favourable conditions* in class. He should also be under the supervision of an itinerant teacher of the deaf and may indeed require some instructional help from that teacher.
- C. The child is suffering from a degree of hearing loss which makes it unduly difficult for him to pursue education in an ordinary school. He requires therefore to attend a special unit within an ordinary school or a school for the partially hearing where he will be taught by a teacher of the deaf and have the help of modern electronic equipment to develop language.
- D. The child is profoundly deaf *and* has virtually no naturally acquired language and so requires education in a school for the deaf under a teacher of the deaf by methods specially devised for such children.
- E. The child is suffering from some degree of hearing loss *and* some other defect which may make it necessary for him to undergo a form of education that is appropriate both to his degree of hearing loss and to his other defect. Unless his hearing loss is so slight that this by itself would lead to grading A, his teacher should be a teacher of the deaf, perhaps qualified in some other appropriate direction.

15. Since, as has been said, a decision must be reached regarding the child's education, we consider that, in practice, the categories outlined in paragraph 14 constitute a system of grades, and we *recommend* its adoption. We recognise, however, that every child presents an individual problem which may make his educational grading (his ascertainment) very uncertain and, as indicated in paragraph 10, we consider that no ascertainment should be final. Accordingly, we *recommend* that the record of every pupil suffering from the handicap of deafness should be reviewed at reasonable intervals (which may vary according to the grade), and certainly when the teacher asks for it. At a review, the school record, including the opinion of the teacher, should be regarded as an important part of the evidence.

16. There is one complication which may be mentioned at this stage. In the modern view, some children who would formerly have been regarded as deaf are in fact suffering from "aphasia" or some form of "auditory imperception", terms, however, which cover conditions that are not yet fully understood. It is significant that in recent times, a considerable number of cases reaching the Audiology Clinic in Glasgow have been thought to be aphasic and not deaf. It may be therefore that to Grades A to E (paragraph 14) there should be added another grade, Grade F, for children who suffer from some form of auditory imperception, whatever precisely that may be. The kind of education that is suited to such children is not yet known with any certainty. The complicated and difficult subject with which this paragraph is concerned is briefly dealt with in Appendix II.

* We recognise that the term "favourable conditions" is vague. The more definite term "favourable position in class" (meaning near the teacher or with the better ear towards the teacher) was used in earlier reports; but since the modern teacher organises her class on much less rigid lines than formerly, the term "position" has lost much of its force. When we use the term "favourable conditions" we envisage that the authority will try to arrange for the pupil to attend a school where extraneous noise is slight and where the teacher concerned will be constantly alive to the need to provide as good hearing conditions for the pupil as are practicable.

Criteria of Ascertainment

17. It would be helpful, and go a long way to satisfy the requirements of our remit, if, at this stage when we have examined the various possible decisions that may be reached in the process of ascertainment, we were to set down the criteria by which the decisions were to be reached. This, however, we cannot do : we have stated in paragraph 10 above that the degree of hearing loss is not by itself a decisive factor in determining a pupil's educational grading and we have indicated in the early part of paragraph 14 that the decision requires to be a balanced judgement based on a number of factors, of which hearing loss is only one—a judgement which can be reached only by a team of experts who are in possession of all the known facts about the child. The assessment of the facts in a particular case will be individual to that case : it is not possible to provide a simple recipe or set of criteria against which judgements can be made in all cases. At the same time, there are a few principles which are perhaps worth setting down, and this we do in the next paragraph.

18. Ascertainment is a decision for an educational purpose. It is therefore premature to attempt ascertainment with babies and very young children. For them, the first work to be done is diagnosis : the child's general medical condition and his degree of hearing loss are examined as fully as circumstances permit ; his home background and the possible degree of parental co-operation are noted ; his general character traits are watched and his degree of intelligence inferred from his general behaviour. (The formal testing of intelligence is not possible till later.) In the light of the information provided by this battery of medical, otological, social and psychological assessments, his parents should be given the greatest degree of help possible in the early training and education of the child. Later, as soon as practicable, he should be given the advantage of nursery school education. His reaction to this régime is then noted and the whole of this background of information should be used at the proper time in forming the judgement which is ascertainment.

19. We have emphasised in Chapter I the importance of language as a prerequisite of further learning and we have shown how deafness in young children may prevent or retard the normal development of language. With this in mind we consider that perhaps the most fundamental criterion in ascertainment is the child's degree of development of language and the potentiality he shows for further language development.

20. The following are significant factors in determining language potentiality :

The amount of language which the child has already acquired.

The child who has developed language to some degree before he suffered hearing loss will build upon this and will be in a much better educational position than the child deaf from birth. In general, therefore, the child with a language background should be graded higher than the child with the same hearing loss who has little or no language background. The child whose language development up to age four years has been more or less normal should probably never be put into Grade D.

The extent of hearing loss.

Language potentiality will obviously be greater if the child hears well ; and less if he hears little. We put forward the following tentative suggestions as a rough guide :

(a) If the hearing loss is less than 30 decibels, then, in the absence of contrary complicating factors, the child should probably be fit to attend an ordinary school ;

(b) if the hearing loss is more than 90 decibels and if there has been little language development, the child should probably be assigned to Grade D ; but

(c) if the hearing loss is between 30 and 90 decibels ascertainment is difficult, so difficult indeed that the ascertainment team, reviewing all the evidence, may place different children in the Grades B, C and D. Nevertheless, it is likely that they will frequently classify as Grade B those children with hearing losses up to 40 or 50 decibels, who have shown considerable language development before the age of five years ; and similarly will frequently classify as Grade D children with a hearing loss of 70-90 decibels, especially if there is little language development.

The degree of intelligence.

It is obvious that the more intelligent a child is, the better able he will be to make the most of his educational environment and to acquire language. Intelligence may help him in lip-reading and in making the intuitive leaps towards the significance of a word or idea. There is one danger concerning which we wish to strike a note of warning : it is possible for a pupil, as a result of high intelligence, to do reasonably well in a somewhat inappropriate school environment, when in fact he would do better and realise his potentiality to a greater degree in a more suitable educational environment. Teachers and ascertainment teams should, therefore, not be satisfied because an able pupil is doing reasonably well in an ordinary school without special help, if by being given such help he could do better.

The child's psychological make-up.

There are psychological qualities apart from intelligence which may have an important influence on the educational progress made by a child with hearing loss. The boisterous youngster who will not be bothered with a hearing aid will make less progress than the dutifully obedient child who will always wear his aid; the extroverted child who will look at lips or endeavour to make speech sounds will do better than one who is too shy to do so ; the persevering hard-working youngster who will continue to battle for communication against disappointments (and there may be many) will do better than the boy or girl who gives in more readily.

The human environment.

Children with hearing loss require the help of those around them. A child whose parents provide him with guidance, encouragement and love, will probably do better than one who receives less help from those who surround him. Parenthetically, we may say here that matrons and non-teaching staff of residential schools for deaf children should be as helpful as they can ; they should certainly be encouraged and helped through training to provide an appropriate background for their charges.

Progress already made.

The progress that a child has made in the recent past provides a useful summary of his ability to cope with his handicap and of his potentiality for the future. It is for this reason that a progress report from a skilled teacher of the deaf is of great importance in ascertainment or re-ascertainment. It requires a skilled

person to assess progress : some of the significant signs (such as the habit of looking at the speaker's mouth as an essential part of lip-reading) may easily be missed by an observer untrained in this very specialised field. We wish again to emphasise that we consider re-appraisal in the light of progress to be an essential part in the continuing task of ascertainment and re-ascertainment.

21. There are two further points concerning ascertainment to which we wish to draw attention :

(a) A number of children suffer from a hearing loss which mainly affects sounds in a particular frequency range ; for example, although there may be some loss at all registers, the main loss may be at high frequencies (which occur in speech mainly in the *S* and *Th* sounds). Thus the child's hearing is distorted. Again, it is not uncommon for hearing aids to magnify all sounds equally, and so, although they give the child more sound to hear, the distortion of the complete sound picture may remain. Thus, in the work of ascertainment, the degree of hearing loss at different frequencies is an important consideration.

(b) Most special schools for children with defective hearing have been acoustically treated hut ordinary schools, in which some children with hearing loss are educated, vary greatly in acoustic properties, e.g., in the amount of noise which may come from outside or inside the building. As it should be the aim of ascertainment to select the best educational environment possible, the children who are hard of hearing, particularly those graded B, should be sent only to a school where acoustic conditions are good.

Statistics

22. In the field which is our concern, educational statistics are important to administrators and to research workers since they provide the figures which show the actual position at any time and also show developmental trends, such as any increasing or diminishing incidence of deafness. Present statistics on children with defective hearing who are receiving education in various types of schools are no doubt accurately compiled in the sense that they show total rolls correctly, but they are misleading in relation to ascertainment for various reasons :

(a) the figures are incomplete—some cases of deafness are still discovered too late ;

(b) ascertainment at present naturally pays regard to the educational facilities available ; a child may be ascertained for a particular form of education not because it is the best suited to him, but because it is the best that is available for him ; and

(c) the criteria of ascertainment are not sufficiently defined to enable it to be said that grading by one authority is even closely similar to (still less the same as) the grading of another.

23. It will be seen later that we envisage and recommend a system of ascertainment to cover the whole country adequately. There will be no guarantee that ascertainment teams working in different parts of the country will operate on precisely the same standards, but we hope that their standards will be reasonably alike. For example, we would hope that representatives of the various teams would meet together from time to time in conference and that these conferences would tend to generate generally acceptable standards of ascertainment and even to define them. National statistics would themselves help to bring about more

uniform standards, since members of any team, comparing their own results with the national figures, would no doubt be prompted to examine and criticise their own standards. We *recommend* that, from the time when a comprehensive system of ascertainment is established, records should be maintained which will be of use to both administrative and research workers. We think that it would not be an unduly heavy task to ensure that for every child who has been diagnosed as suffering from hearing loss (except perhaps those in Grade A) three facts should be recorded :

- (a) the degree of hearing loss as ascertained by careful audiometric measurement ;
- (b) the grading recommended by the ascertainment team after taking into account hearing loss and other relevant factors ; and
- (c) the type of education which he is actually receiving.

From the national records, it would be interesting to note, for example, in regard to all the pupils of some particular ascertainment grade, the distribution of hearing losses ; or, conversely, to note, in regard to all in the same range of hearing loss, the distribution of ascertainment grades ; to see how closely (b) above corresponds to (c) ; and to watch changes over the years with a view to understanding why these changes had occurred.

Incidence

24. The 1938 Report, " Children with Defective Hearing ", which took into account the important surveys made up to that time, said that the incidence of deafness in the school population might be expected, on its system of grading, to be as follows :

No. of children (per 1,000 of roll)		
Grade I . . .	.	50-80
Grade IIA . . .	.	0.5-2.0
Grade IIB . . .	.	0.5
Grade III . . .	.	0.7

25. The 1949 Report, " Pupils who are Defective in Hearing ", taking into account the further evidence that had accumulated by that time, gave, on the same system of grading, the following estimates for Scotland :

No. of children (per 1,000 of roll)		
Grade I . . .	.	50-80
Grade IIA . . .	.	2.0-9.0
Grade IIB . . .	.	0.5-1.0
Grade III . . .	.	0.7

26. Noting the discrepancy in the two sets of figures quoted above, we have examined, in the course of our deliberations and in our discussions with witnesses, the figures of a number of surveys made in recent years on both sides of the Atlantic. But, despite the careful work that has been done in various areas, we are inclined to agree with Professor-Emeritus Sir Alexander Ewing, formerly of Manchester University, that no authoritative figures can yet be given for the incidence of hearing defects in children.

27. It does seem to us, however, that the figures quoted in paragraph 25 above may be regarded as providing a broad working guide. It will be noted that the figures for Grades I and IIA show wide limits. These wide limits arise not only because of uncertainty, but because it is known that the incidence of hearing defect

does vary quite considerably from place to place. Provisionally, we suggest that administrators in any area might expect that about 1.5 children per 1,000 may require to be in special schools or classes and that a further 10 at least will require some degree of special attention or provision in ordinary schools.

28. The general survey scheme, which we propose, should provide in due course some authoritative figures regarding incidence.

Educational Provision in Scotland for Children with Defective Hearing

29. In January 1966, according to the official figures, the numbers of children in the public and grant-aided schools of Scotland who were receiving various forms of special educational treatment because of defects in hearing were as follows :

<i>At Schools or Classes or Units for the Deaf or Partially Deaf</i>				<i>Deaf</i>	<i>Partially Deaf</i>
Aberdeen School for the Deaf*	.	.	.	35	15
Dundee School for the Deaf*	.	.	.	37	16
Edinburgh, Donaldson's School for the Deaf*	.	.	.	159	12
Edinburgh, St. Giles School	.	.	.	—	81
Glasgow School for the Deaf	.	.	.	65	—
Glasgow, Parkhouse School*	.	.	.	—	39
Glasgow, St. Vincent's (Tollcross) School*	.	.	.	53	42
Ayrshire, West Park School*	.	.	.	—	36
Dumbartonshire, Hartfield School	.	.	.	—	7
Lanarkshire, Auchinraith School*	.	.	.	45	7
Lanarkshire, Drumpark School†	.	.	.	—	10
Renfrewshire, Garvel School*	.	.	.	3	4
Renfrewshire, Gateside School*	.	.	.	5	6
Stirlingshire, Dawson Park School	.	.	.	—	11
				402	286
At other Special Schools	.	.	.	1	11
			Total	403	297

* These schools provide for children of nursery school age and upwards.

† This school has a class for pupils who are both partially deaf and mentally handicapped.

30. In addition, four education authorities employed a total of seven qualified teachers of the deaf to give itinerant help to partially deaf children in ordinary schools. It is also known that many children with hearing defect who are in attendance at ordinary schools are receiving some special attention, e.g., they may have been supplied with hearing aids.

CHAPTER III

A Comprehensive Scheme of Ascertainment—In Outline

31. We have already recommended (paragraph 3) that the detection of deafness in children should be more thorough than it is and that it should be the aim to detect hearing loss at as early a stage as possible in the child's life. In this chapter we *outline* a plan for achieving these objectives and in later chapters elaborate our plan in some detail. The plan aims at the establishment of ascertainment arrangements for territories which, together, will cover the whole of Scotland. In considering and in formulating our plan, we have realised that more adequate and more thorough arrangements than those already in existence are bound to make greater demands on professional services and on money than are made at the moment ; at the same time, we have been anxious to keep idealism from running beyond the limits of what is severely practicable. Further, we have realised that Scotland is not made up entirely of cities like Glasgow and Edinburgh, but also includes large thinly populated areas where there are special problems of distance and of staffing.

32. Our comprehensive plan involves the following :

ORGANISATION

33. Although we envisage arrangements that will cover the whole country, we consider that they should be operated on a territorial basis, the territory concerned being, according to geographical circumstances, the city or the county, or a combination of these for this specific purpose. We use the rather cumbersome word "territory" in preference to "region" solely because the words "region" and "regional" have already acquired particular connotations, e.g., in the title "regional hospital board". Existing regions or areas (for whatever purpose) may or may not coincide with the territories best suited for the arrangements which we have in mind. Each of the territories concerned must have the services of an ascertainment team (see paragraph 38 below) of specialists in work relating to children with hearing defect and so must be able to call upon the representatives of a minimum of three or four different but complementary specialisms. The work done should be under the administrative charge of the Medical Officer of Health of the city or county chosen to be responsible for the arrangements throughout the territory ; he should be the key figure in the organisation.

"AT RISK" REGISTERS

34. Each health authority should maintain, as most already do, an "at risk" register, placing on it the names of all babies born who, from the nature of their heredity or of their history (pre-natal, natal or post-natal), are likely to stand a much higher than average chance of suffering from handicaps, including defective hearing.

DISCOVERY BY GENERAL MEDICAL PRACTITIONERS

35. Cases of suspected hearing deficiency may be brought forward by the parents, usually to the family doctor, or may be suspected by the doctor when

visiting the child for some other purpose. In our later and more detailed exposition of the arrangements, we provide that cases discovered by or through the general medical practitioner should be reported by him either to the local Medical Officer of Health or the medical officer in charge of the territorial organisation. Reciprocally, the family doctor should be kept informed of the results of the examination of any of his child-patients.

PRELIMINARY SCREENING

36. Many cases of hearing deficiency will escape the net provided by parents and general medical practitioners. But all children are seen from time to time in infancy by health visitors and we *recommend* that it be part of their duty in all areas (as it already is in some) to carry out simple screening tests on *all* children between the ages of six and twelve months, in order to report to their medical officer all cases where there is any suspicion of defect. In this *preliminary screening* procedure, particular attention should be paid to the children on the "at risk" register.

SCREENING

37. After the health visitor has reported all cases where her suspicions have been aroused or where a general practitioner has notified a suspected case, a rather more detailed examination is needed. We *recommend* that this examination should be undertaken by a local authority medical officer who has had some special training in the work. According to the staffing arrangements, which should be worked out locally, this officer may or may not be a member of the ascertainment team (see paragraph 38 below). The main purpose of his examination—the *screening* process—is to separate those with actual defects from those whose hearing is found to be normal.

ASCERTAINMENT TEAM

38. We consider that where the family doctor or the screening process has found a child to be suffering from a hearing loss with no simple remediable cause, the child should be referred to an expert team—the *ascertainment team*. (Its constitution is discussed in paragraph 51 below.) After each member of that team has examined the records and made for himself such examination of the child as he may think necessary, the members should discuss the case and determine the action to be taken.

AUDIOMETRIC TESTING

39. (a) If a child is discovered in babyhood to be suffering from impaired hearing, he should be given an audiometric test as soon as practicable (usually at the age of three or four years).

(b) *All* children entering school should be given an audiometric sweep test at age five to six years. This test should catch almost all children who have escaped the earlier screening net or who have developed some degree of deafness after babyhood. All cases of defective hearing should be reported to the Medical Officer of Health in charge of the ascertainment arrangements.

AN ASCERTAINMENT REGISTER

40. All children discovered by the ascertainment team to require special medical, surgical or educational attention because of impaired hearing should be entered on an *ascertainment register* maintained by the Medical Officer of Health in

charge of the arrangements. Along with this register, a continued history of each case should be maintained. This history is the *ascertainment record*.

RE-ASSESSMENT

41. All cases which reach the ascertainment team should be kept under review : although assessment for educational purposes (i.e., ascertainment) should be made as soon as possible and not later than the age of five or six years, re-ascertainment should take place at critical stages in the pupil's school career.

OTHER SPECIALIST ADVICE

42. Any case considered by the ascertainment team may present difficulties which lead the team to seek other specialist opinion. If the required specialist is not available locally, the child may have to be sent to a city where a full range of specialists is available.

PROCEDURE

43. The work of the ascertainment team is to determine the treatment best suited to the needs of the child :

(a) When a child is reported to the team, the otologist will advise appropriate medical or surgical treatment wherever there is a hope that the condition can be improved. Where it is likely that, despite anything that may be done, some degree of handicap will remain, the team will advise the appropriate teacher of the deaf, who will visit the parents, explain the difficulties that the handicap will entail, give them continuing help in the management and use of hearing aids and in the methods they should use in promoting the child's linguistic development.

(b) As soon as the child is two years old, the ascertainment team will consider the form of early education best suited to his needs: it may decide that he should remain at home, but will more often recommend attendance at some form of nursery school. When the child is almost five years old, the team will require to make up its mind which form of schooling he requires (in terms of the grading described in paragraph 14 above), and the education authority will no doubt make their formal decision on the basis of its advice. This decision will be subject to revision, i.e., re-assessment must be kept in mind.

(c) The ascertainment team should be able to give useful vocational advice to pupils about to leave school.

CHAPTER IV

Some Administrative Matters

The Place of the Education Authority in regard to Children under the Age of Two

44. While the local health authority has powers and duties to care for and deal with persons of all ages, including babies, education authorities have at present neither powers nor duties relating to very young children. As the Education (Scotland) Acts stand, the education authority is obliged to provide education for children of school age and has various powers in regard to children down to the age of two years, but has no powers regarding children below the age of two years. Nevertheless, already various education authorities are not hesitating to help in work with very young children, including the detection of deafness.

45. The plan which we envisage and have described in outline above involves regularising the help given by the education authority. Its teachers of the deaf, and educational psychologists, will be important members of the ascertainment team which will deal with very young children ; its audiometricians will require to undertake the testing of young children ; its teachers of the deaf will require to give help and advice to parents of deaf children too young to go to school, even to a nursery school ; its premises, whether medical inspection rooms in schools or in clinics, may be used for testing babies. We therefore *recommend* that, by a change in the law, the education authority should be given powers to investigate and to take appropriate action in regard to children under two years of age who are suspected of hearing defect.

46. In the remainder of this Report we assume that this change in the law will be made.

Co-operation at Authority Level

47. In outlining in paragraphs 32-43 our general plan for ascertainment on a territorial basis, we have said that the person who should hold the key position is a Medical Officer of Health. In reaching this conclusion we have borne in mind that a Medical Officer of Health for a city or county already has the general health of young children in his own area under his care so that the discovery of deafness is a natural part of his function ; on his staff are health visitors, who play an important part in our scheme ; and he has contacts with the hospitals where specialist members (e.g., the otologist) of an ascertainment team may be employed. As head of the school health service in his area, he also has important educational contacts. This is important, since diagnosis of deafness leads to ascertainment for an educational purpose ; the child who is irremediably deaf may cease to be a medical case, but he certainly continues to be an educational one and so his record should be in educational hands ; some of the members of the ascertainment team, such as the teacher of the deaf or the educational psychologist, are likely to be drawn from the educational staff. The educational umbrella covers the whole county, including the large burghs, whereas the large burghs, in matters of health, are autonomous ; it is, therefore, obvious that, for

the smooth working of the ascertainment service, amicable co-operation is essential, not only between the medical officer in charge and the Directors of Education but also between the medical officer and the other Medical Officers of Health within the territory.

48. The arrangements between the constituent authorities within the territory require consideration. The health visitors of, for example, a large burgh will be in the employment of the burgh ; a large burgh may well have clinics which could serve not only the town but the county area around ; but, on the other hand, education within the burgh is the concern of the county and some of the staff required for an ascertainment team will be county employees. The position is further complicated where a territory comprises more than one education area and is evidently one which requires close and friendly co-operation. We consider that the nature of that co-operation should be devised by the participants concerned ; the pattern may not be the same in all territories.

49. Whatever final local arrangements may be worked out to cover the situations discussed in the last two paragraphs, we consider that several points are clear and so we *recommend* that :

(a) Where a child has been referred to the ascertainment team and it decides that he suffers from a degree of deafness that requires him to remain under its supervision, the medical officer in charge of the ascertainment arrangements must ensure that the child, whether from a large burgh or the county, is on the ascertainment register (paragraph 40) and that his ascertainment record is established.

(b) A copy of any educational recommendations made by the ascertainment team should be sent to the Director of Education concerned, as soon as possible after they are made, in order that the formal step of ascertainment may be taken (if necessary), and that he may arrange educational provision for the child in accordance (as far as possible) with the ascertainment.

(c) The receiving school should be given from the ascertainment record a statement of such facts about the child's medical, psychological and educational condition as will enable the school to give the child appropriate education. We are aware that a doctor is in a position of confidential trust in matters relating to his patients, but where appropriate treatment is concerned certain facts must be made known to those who will undertake the treatment, whether they are teachers in schools or nurses in hospitals. In such cases the teacher (or the nurse in hospital or clinic) is also in a position of confidential trust.

(d) The medical officer in charge of the ascertainment arrangements should arrange (i) that the co-operation of the parents of a child with hearing loss is sought so that any necessary medical or surgical treatment may be given or that a hearing aid may be supplied and be well looked after ; and (ii) that visits be paid to the parents by a teacher of the deaf and/or a social worker in order to seek their help and to advise them in providing at home the emotional and educational environment which the child requires.

(e) The medical officer should ensure that the team keeps cases under sufficient review.

(f) The medical officer should also ensure that the family doctor in each case is informed of the situation as the team sees it.

(g) When a pupil suffering from some degree of deafness leaves school, the medical officer should ensure, through the local health authority and/or welfare service, that the leaver receives help and guidance. In addition, the Youth Employment Officer will be concerned at this stage, when it is desirable also to inform the local welfare worker for the deaf.

Ascertainment Teams

50. The ascertainment arrangements which we have outlined imply the establishment of a number of ascertainment teams working throughout the country, each in its own territory. Each team will be able to bring expert opinion to bear on cases of impaired hearing discovered through the local screening arrangements ; we would expect that when teams are established, account would be taken of centres already in existence, for example, in hospitals.

51. In the course of our investigations, we have interviewed specialists in various fields who are concerned in the medical, psychological and educational welfare of deaf children and many of these specialists have pointed out the particular contributions which persons of their type may make to the complex and varied work of the ascertainment teams. We set out below, in alphabetical order, these specialists and indicate what their contributions might be :

The *audiologist*, having by training or experience a fairly advanced knowledge of the physics of sound, the anatomy, physiology and pathology of hearing and speech and the psychology and education of the deaf, may play a key part in the testing of hearing and in the early training of the deaf child.

The *educational psychologist* (who should be specially trained for, or experienced in, the testing of young and/or deaf children) will evaluate those factors other than degree of hearing loss which may have a vital bearing on the child's educational placement and future.

The *neurologist* will investigate and evaluate factors within his speciality which may be associated or confused with deafness.

The *otologist* will be able to recognise the types of deafness which arise from ear trouble and will decide whether the defect can be cured or ameliorated. More generally, he will bring to bear upon the case all his knowledge and experience of deafness.

The *paediatrician*, a specialist with children (who may also be a specialist of another kind, e.g., neurologist), will be able to take a general medical view of the case, especially where the deafness may be associated with another handicap.

The *psychiatrist*, who should be experienced in child psychiatry, may be needed to deal with behaviour problems and/or to establish the diagnosis of autism (see Appendix II).

The *teacher of the deaf* is a general teacher as well as a specialist teacher of the deaf and will be able to consider the nature of the child's handicap(s) in a school context and be well fitted to advise on his educational future.

52. We recommend that, while no ascertainment team need be large, each should consist *at least* of the following permanent members : the Medical Officer of Health in charge of the ascertainment arrangements, or a medical officer with special training in or special knowledge or experience of this work chosen by

him ; a teacher of the deaf (who may himself be an audiologist) ; an educational psychologist ; and an otologist.

53. We make the following notes on the work of, and of the arrangements concerning, an ascertainment team :

(a) It will be observed that, while we regard the selected Medical Officer of Health as the key person responsible for the general ascertainment arrangements in the territory, he may not himself be specially qualified to deal with the problems of deafness, and we therefore envisage that he may choose a medical officer to act for him on the ascertainment team. By local arrangement, this officer may do the screening (paragraph 37) in one or more of the areas comprised within the territory.

(b) The ascertainment team should be of a calibre to give expert guidance on cases arising in the area, and, in reaching its decision on any child, it will take into account the degree of deafness, other medical factors, the degree of language development, the child's intelligence, the other psychological factors (persistence, extroversion and the like) which may have an influence on his will to learn, the degree of help and co-operation that may be expected in the child's own home and any other relevant considerations.

(c) The team will not necessarily itself make all the observations which it will consider. For example, it will pay heed to the reports, as available or requested, on the home conditions given by a health visitor or social worker, on educational progress by the class teacher and to any measurements made by the audiometrician. In this way, the health visitor, social worker, class teacher or audiometrician may greatly influence the decisions of the ascertainment team (by whom they may be orally consulted) although not necessarily members of it.

(d) Despite the measurements and observations that may be available to the team from the work of others, any member of a team may wish to make for himself measurements or examinations in his own field.

(e) If, as a result of some uncertainty, the team should consider that it requires additional advice, it should invoke the help of other available specialists in the district who are not regular members of the team. Thus, for example, the paediatrician or neurologist or psychiatrist may be consulted and play his part in helping the team to reach its decision. It would possibly be a useful arrangement when the team is first formed to nominate local specialists who might be called upon to bring their particular specialisms to bear on particular cases.

(f) The team may require specialist help of a kind not available in the neighbourhood, e.g., when there is doubt whether the child is suffering from some form of imperception as distinct from peripheral deafness. In such circumstances it is always possible for the team to seek the aid at a city hospital of a consultant of the type required. In this event, the child, probably accompanied by his parent, will visit the city hospital, and after the specialist has completed his investigation he will advise the team and collaborate with it in reaching a final decision.

(g) The team should also keep its cases under medical and educational review, attaching much importance to any progress reports asked for from the school or specially submitted by the school.

(h) With the help of the medical officer who has been appointed to the team from the local authority staff, a register of team cases should be kept, along with a continuing record for each child.

(i) When a child moves to another territory, his ascertainment record should be passed on, in order that he may remain under the care of an ascertainment team.

(j) Where it is proposed to send a child to a residential school, a copy of his ascertainment record should be made available to the head teacher of that school and to the ascertainment team concerned. When the child is enrolled at the residential school, the original ascertainment record should be retained by the education authority responsible for his placement.

Premises

54. Tests of hearing are easily upset, or even completely vitiated, by a background of extraneous sound. We therefore consider it advisable to set down a series of notes on the suitability of various types of premises where audiological work may take place.

THE CHILDREN'S OWN HOMES

55. The general practitioner or the health visitor will normally meet the child in the child's own home. If the house is in a quiet neighbourhood, and if noise in the house is avoided when tests are in progress, a room there will normally be well suited for simple tests of hearing. If, at the other extreme, external noises are fairly continuous and quite noticeable, the house is not suited for such tests, and arrangements should be made to have the tests conducted elsewhere. Between these extremes, the tester must use his or her discretion, but should certainly be fully alive to the possibility that even a slightly noisy background can vitiate results.

AN ORDINARY UNTREATED ROOM

56. Where the child's house is unsuitable for testing, an untreated room in a school or clinic may be used. Untreated rooms may be good or bad places for testing: a room set in quiet surroundings with little disturbance from other parts of the same premises is good; one overlooking a busy thoroughfare or flanked by a noisy school corridor is bad. Well-situated rooms are reasonably satisfactory for (a) preliminary screening by health visitors; (b) screening by medical officers; and (c) sweep audiometric tests.

THE TRAVELLING VAN

57. In country areas, ascertainment services may be brought to the children by means of suitably equipped and treated travelling vans.

A CLINIC WITH ACOUSTIC TREATMENT

58. If a clinic is set in quiet surroundings and in a reasonably quiet building and if steps have been taken to cut down still further the effects of external noise and of reverberations within the room, it may be a reasonably suitable place for audiometric work and may well satisfy the requirements of the person making careful measurements for the ascertainment team.

A SPECIAL AUDIOLOGY CLINIC

59. For very careful work such as the determination of hearing loss with the maximum possible degree of accuracy essential in critical cases, an audiology unit is necessary. This may be regarded as a clinic in which fairly elaborate precautions have been taken to reduce all external sound to acceptable proportions and in

which the walls, doors and windows have been built with special precautions against sound conduction or penetration. An audiology unit is rather expensive to provide and is possibly not justifiable except in the larger hospitals that deal with deafness or as part of the provision of a large local authority.

SOUND-PROOF (ANECHOIC) ROOMS

60. The construction of a room which virtually excludes all external sound or internal reverberation is difficult and costly to achieve and is unnecessary for audiological work, except in some branches of medical or psychological research.

61. There are two matters, not closely related to the above, to which we consider that we ought to refer :

(a) Very great thought has been given in recent years to the provision of good visual conditions in ordinary schools : steps have been taken to ensure adequacy of lighting, both natural and artificial, in all parts of the classrooms ; the avoidance of glare has also received careful attention. We consider that equal thought should be given to the prevention of distracting noises or of their transference from room to room. Many rooms have a sound background in excess of 30 decibels, a figure so high that children with some hearing loss (yet considered able to profit from attendance at an ordinary school) must inevitably fail to hear much of the instruction.

(b) Mothers may be required to bring their babies to clinics a long distance from home, perhaps to have them examined by specialist members of an ascertainment team. The problem of accommodation is very real and worries some mothers. It would, therefore, be an advantage if further steps were taken by hospitals or local authorities to make some accommodation arrangements, whether by having an approved list of lodgings or by providing accommodation at hostels or by other means.

CHAPTER V

Children Under Five

62. In the last chapter we have outlined our general plan for comprehensive diagnostic and ascertainment arrangements and have dealt with some of the general questions that arise in regard, for example, to the administrative set-up and the constitution of an ascertainment team. In this and the next chapter we describe in greater detail the proposed arrangements for dealing with children under the age of five years and with older pupils respectively.

The Testing of Babies

63. We have stated in Chapter I why we are convinced of the great importance of diagnosing any defects of hearing at as early a stage as possible in the child's career.

64. Since the War, much work has been done in this field and the detection of deafness is now possible, with a fair degree of certainty, in children between six and twelve months old. Distraction testing is the screening technique normally applied. For a brief note on this technique, see Appendix III. Parents may well be

the first to suspect deafness, if, for example, they notice that the baby seems to pay unnaturally little heed to sounds such as his mother's voice. When parents suspect abnormality at an early age, or if their suspicions are aroused later because the baby seems to make no response of any kind to speech or, in particular, to make no imitative vocalising efforts of his own, they may take him to their family doctor or to a health clinic. In this way, a number of cases of deafness are suspected or detected early. But parents are not always alert and may not be willing to admit to the possibility of hearing defect. We therefore *recommend* that public authorities should play their part in seeking out, as far as they can, all cases of defective hearing in young children.

65. The group of public service workers who are in contact with all babies are the health visitors (whose duties in some areas are undertaken by district or Queen's nurses) and so we *recommend* that the duty of preliminary screening should be placed on them. The training of a health visitor covers many aspects of mother and baby care but it did not, until recently, normally include training in the discovery of hearing defects. Many authorities have found, however, that after a short period of practical training lasting only a few days, a very large proportion of health visitors can be trained to carry through preliminary screening. The work entailed in this screening involves giving a child tests which the health visitor can normally undertake in a few minutes.

66. We make the following *recommendations* regarding the employment of health visitors for this work :

(a) The course for the Health Visitor's Certificate should include instruction on deafness and in the technique of testing children aged six to twelve months.

(b) The medical officer in charge of ascertainment work should arrange, by agreement where necessary with the medical officer of any other area in the territory, for the health visitors who are to undertake this work to be given practical training in the screening of young children. This training should include the requirement to conduct satisfactorily at least three tests under supervision, and may be arranged either by organising special courses in the area or by sending the health visitors to courses elsewhere.

(c) Similar arrangement may be made for district or Queen's nurses who are acting as health visitors except that it cannot be assumed that there has been any training regarding the detection of deafness in the nurses' basic courses.

(d) There is always a distinct risk that the technique of a health visitor (or other tester who is not an expert) will gradually change so that the test sounds used may be allowed to become gradually louder or gradually fainter ; in short they may not remain the standardised sounds. For this reason, and also to draw attention to new developments, one-day refresher courses of a practical nature should be arranged at intervals of perhaps a year. Preliminary screening will become easier when test-apparatus designed to produce standard sounds automatically is in wider use.

(e) Without disrespect to the health visitors concerned, they cannot be expected to be experts. For this reason we consider that they should be trained not so much to detect possible cases of defective hearing as to detect, and so eliminate from further testing, children who give indubitable signs of good hearing.

67. We have given close consideration to the question of whether health visitors should test all infants or whether they should be given the much smaller task

of testing only a selected sample of babies, i.e., those who have a more than normal chance of suffering from some handicap, which might be hearing defect. Such babies include those born with haemolytic disease ; those with congenital abnormalities ; those born prematurely ; those whose mothers had a history of certain virus infections, e.g., German measles at an early stage of pregnancy ; or those whose birth was attended by peculiar difficulty. Babies in these categories—the list above is not by any means complete—are known as “ at risk ” children and in most areas their names are kept by the Medical Officer of Health on an “ at risk ” register. Although we *recommend* that an “ at risk ” register should be kept, we do not wish to prescribe the form which it should take. We are aware that in some areas very detailed registers are kept for research purposes, while other areas base their registers on fewer of the causes or circumstances which place the children “ at risk ”.

68. Only a fairly small percentage of children on an “ at risk ” register have defective hearing (most are, in fact, normal) but this percentage is much higher, possibly 10 to 15 times higher, than it is in the rest of the population. We have discussed this subject at length and have consulted all our expert witnesses closely upon it ; and from the evidence we are forced to conclude that, if preliminary screening were confined to children on the “ at risk ” register, quite a large proportion—as much as 50 per cent—of infants with defective hearing would be missed. We therefore *recommend* that health visitors should do preliminary screening on *all* children and should report cases of suspected hearing defect to the medical officer. If, however, as a result of shortage of staff, testing of the whole infant population should be impossible, preliminary screening should be applied, during the period when an adequate screening service is being built up, at least to all babies on the “ at risk ” register.

69. We have said in Chapter III that screening by a suitably trained medical officer should be the stage in the ascertainment procedure that follows the stage of preliminary screening. We have these *recommendations* to make on the screening procedure :

(a) The medical officer concerned will not normally be a specialist in deafness or in ear troubles, but he should have some special knowledge of child audiology and some training and skill in testing gained as a result of attending a special course extending over at least a fortnight. He should be able to give, in addition to simple distraction tests, other tests which throw light on the extent and nature of the hearing loss ; and, in certain cases, he may undertake simple remedial treatment.

(b) He should deal with :

- (i) all children brought directly to the notice of the public authority by parents who suspect some degree of hearing loss ;
- (ii) all children brought to the attention of the public authority by general practitioners, unless the practitioner has intimated that other arrangements for specialist examination have been made ;
- (iii) all children brought to his attention by the health visitors ; and
- (iv) any other children, selected for example from the “ at risk ” register, who he considers ought to be tested.

(c) Although the medical officer concerned may find it necessary to examine some children in their own homes (especially in scattered areas) he should test as many as possible in acoustically treated clinics or in a travelling van.

(d) While it is his purpose to eliminate hearing children from his lists so that the ascertainment team may not be overburdened, he should nevertheless refer all cases to the team where there is an element of doubt.

70. The function of the ascertainment team, members of which may personally have investigated any case referred to it from the point of view of their own speciality, is to review all aspects of a case—the extent of the child's hearing loss at different frequencies, his medical condition, both general and otological, and his general development—in order to establish diagnosis in the widest sense. The time for true educational assessment has hardly yet arrived. There are several immediate purposes to be served: if the otologist can see any hope of improvement or cure appropriate steps should be taken; if the child has irremediable hearing loss but yet has some residual hearing which can be put to use, the most suitable hearing aid should be prescribed by the otologist. After a medical officer has informed the parents of the child's deafness, a teacher of the deaf should be detailed to visit the home to advise the parents how to provide the educational and developmental environment which the child most needs. The services of a social worker might be helpful where the home circumstances are difficult. The training of the parents cannot generally be effectively achieved at one visit; continued training is normally necessary.

71. Despite all the care that may be exercised even in a well developed service, some cases of hearing loss may still escape detection. The health visitors should therefore constantly be on the watch for any additional cases which may show themselves—such as those of children whose speech development is arrested (for example, any child who is not joining words in speech by age two should be regarded as a suspect) or who may have contracted illnesses that put them "at risk". Any supplementary cases arising as described in this paragraph should be referred by the health visitor to the medical officer detailed for this purpose; and by him, as necessary, to the team.

The Over Threes

72. The distraction and other diagnostic tests which are available for a young child are useful and may indeed give a reasonably good idea of the degree and type of his hearing loss, but they yield by no means exact measures of the child's disability. As soon therefore as the child who is known to the ascertainment team to be suffering, or possibly suffering, from hearing defect is old enough to respond to the technique of audiometric measurement—a stage which is occasionally reached at age three years but more normally between the ages of four and five years—he should be tested by a person who has had adequate training and experience in the audiometric testing of children with defective hearing. Audiometry will measure with considerable certainty and accuracy the extent of the hearing loss and whether it covers the whole of the frequency range of sound or whether it occurs only at parts of the frequency range. (See paragraph 21 and Appendix II.)

73. As soon after the age of two as possible, the young child who is suffering from deafness of any degree should be provided with a nursery school training. For the seriously deaf child, this should normally be in the nursery department of a school for the deaf where special education in language will be deliberately

begun. For those whose deafness is partial (and also for any seriously deaf child whose admission to a nursery class for the deaf would mean residential placement for which he may not be emotionally ready), attendance should be arranged at an ordinary nursery unit, so that they may benefit from the stimulus to language provided by contact with hearing children. If possible, all children with hearing defects in attendance at ordinary nursery units should receive some help from an itinerant teacher of the deaf. The child's reactions in a nursery school of whatever kind, especially when observed from time to time by a teacher of the deaf, give important clues as to the nature of the education for which he is likely to be best suited—whether in an ordinary school, a special school for the partially hearing, or a special school for the deaf.

74. The use of nursery schools as described in the last paragraph presupposes a wider provision of such schools than exists at the moment. It would be ideal if there were a nursery school or class (for normal children) available within travelling distance of each child with hearing defect. Such schools are provided, however, only when the surrounding population justifies them. In view of his special needs, the child with impaired hearing should be allowed to attend, if possible, the nearest nursery school, whether this is within or outside his county boundary. We therefore *recommend* that :

(a) when the present restrictions on the building of nursery schools are relaxed, the needs of children with hearing defect should be specially borne in mind ; and

(b) a sufficient number of places should be established in nursery departments in schools for the deaf or partially hearing to accommodate all children who require them. Some of these places, as at present, would require to be residential.

75. By way of summary of what we have already said, we emphasise that when members of the ascertainment team first assess the young child, only six to twelve months old or thereby, his condition may be diagnosed, but full ascertainment with an educational purpose is not possible. The team should, however, keep the child under review and ascertainment will become increasingly possible when a measure of his deafness is obtained (see paragraph 72) and observations have been made of his behaviour in a nursery school (see paragraph 73).

Attitude to Parents

76. It is a severe shock to parents to be told that their child is deaf or severely handicapped by deafness. All work in this field should therefore be done in the most sympathetic manner possible. We therefore *recommend* that :

(a) At the stage of preliminary screening by the health visitors where all children are tested but only a small proportion will be found to be handicapped, every care should be taken not to worry or frighten the parents. The testing should be regarded as a simple routine and should not be taken to imply any suspicion whatever that the child is handicapped. As a large proportion of children technically " at risk " (in the sense above defined) are not in fact handicapped at all, special care should be taken to avoid frightening parents by the use of this term, with all the implications which it may carry.

(b) When some degree—particularly a high degree—of deafness is established, the parents must be told as sympathetically as possible. After their minds have had a little time to grow attuned to the situation, efforts should be made to make them face the full truth. They should then be carefully informed what the handi-

cap of deafness implies and brought to realise that, in the child's interest, they should co-operate in doing all they can for his future welfare, by providing, as far as they are able, a suitable developmental environment at home and by permitting him, even at a tender age, to go into residence at a special school, if this is necessary. It would probably help to overcome parents' reluctance to allow their child to go to a residential school if it were possible to organise the residential side of such schools into small units, each under a house-mother or house-parents.

Some further Recommendations and Suggestions

77. As a result of our consideration of the issues dealt with in this chapter we consider that :

(a) Where the child of deaf parents is also deaf, special efforts should be made by the ascertainment team to have him provided, at as early an age as possible, with an environment that will stimulate speech.

(b) Where the parents (or the mother) of a hearing child are (is) deaf, and where therefore the child is denied at home the normal opportunities of developing speech, the child should have the stimulation of associating at as early an age as possible with persons of normal hearing, including children, in day-nursery, nursery school or elsewhere.

(c) Where an ascertainment team recommends that a child suffering from hearing loss should be sent to a nursery school, partly as an aid to his development and partly for observation, the education authority concerned should do their best to find a place for the child in question by giving him priority over other children.

(d) Where an ascertainment team has diagnosed a child as suffering from hearing loss and recommends a particular line of educational treatment, e.g., attendance at a nursery school, the parents should be given every encouragement to permit the child to take advantage of the type of education prescribed.

(e) Where a general medical practitioner or specialist suspects or confirms a case of irremediable deafness, it should be his duty to notify this just as it is his duty to notify certain infectious diseases. When the Medical Officer of Health in charge of the ascertainment arrangements is informed of this he will have the name entered on the ascertainment register.

CHAPTER VI

Children Over Five

General Sweep Tests

78. By the time that they are five years of age, a large number of the children who are defective in hearing will have been detected by the processes which we have described in the last chapter. But, however adequate the arrangements, some cases will escape detection. Moreover, it is always possible that a child may become deaf as a result of illness in the intervening years. We therefore *recommend* that an audiometric sweep test should be given to all children as soon as possible after they enter school, preferably before they reach the age of five and a half years and certainly before they are six years of age. The aim of a sweep

test, which should be carried through by adequately trained personnel*, is to discover whether a child can hear normally or nearly so. No effort is made in the sweep test to measure the extent of hearing loss. Sweep frequency audiometry is described in paragraph 11 of Appendix III. Any child who fails to pass the test should be reported to the medical officer in administrative charge of the ascertainment team who will then make the next arrangements. This general sweep test should ensure that undetected cases are very rare—although some watch must be kept for deafness which may develop later through illness or other cause.

79. There are two other occasions when a general sweep test of all school children should be undertaken in order to discover any new cases of impaired hearing—towards the end of the pupil's career in the primary school and again shortly before the school leaving age. These may be arranged to coincide with the routine school medical examinations which occur at these times.

Continued Testing

80. We wish it clearly to be understood, in relation both to the last chapter and to this, that we envisage that the ascertainment team will continue to keep under observation and review all cases known to it, so long as the children remain of school age. These cases will indeed be on an ascertainment register. By "keeping under review" we mean that the ascertainment team will, as often as it thinks necessary, have the child's hearing loss re-measured or have his ears re-examined (and, if necessary, treated) by an otologist, or have him referred (when central deafness is a possibility) to a neurological paediatrician, or have him re-assessed by an educational psychologist; it will certainly keep under close review his school reports from the teacher of the deaf or his class teacher, and will pay particular attention to his progress in language and speech. We wish to emphasise that ascertainment for educational purposes is so very uncertain that the team has constantly to be ready to change its view as a result of school evidence, particularly on the side of language development. If, for example, a pupil is not making expected progress in the ordinary school and it seems likely that he might make better progress in a school for the partially hearing, the team should be ready to re-assess (or regrade) him. Similarly, if his progress in a school or unit for the partially hearing strongly suggests that he could cope successfully in an ordinary school, his grading should be reconsidered.

Particular Difficulties

81. In the past there have been many cases of lack of school progress which have been attributed to lack of intelligence or ability when in fact partial deafness has been the cause. We particularly wish, therefore, to draw the attention of all concerned to the possibility that scholastic non-success may be attributed to the wrong cause. We *recommend* that the practice of some authorities be universally adopted whereby no pupil is ascertained as mentally handicapped unless his

* Audiometricians have in the past been recruited from various walks of life and trained in the use of the audiometer, either at the recognised course for audiometricians at the Glasgow Ear, Nose and Throat Hospital or elsewhere. In some parts of Scotland sweep tests and full audiometry are done by teachers of the deaf, who are very well qualified to do the tests and who have a special contribution to make in the assessment of a child found to have defective hearing; administering sweep tests may not, however, be the most economic way to employ specialist teachers. The Committee, while recognising that ad hoc arrangements for training have been inevitable while the audiometric service has been developing, hope that in the future the service should be staffed by persons who have attended the recognised course and have passed at least Part I of the examination set by the Society of Audiology Technicians, or that personnel newly employed without this qualification should be seconded to the course as soon as possible. This should ensure that audiometricians are not only familiar with all aspects of their work as technicians, but also apply this knowledge in a standardised way. The educational qualification for the training course in Glasgow is "O" level passes in the Scottish Certificate of Education in four subjects, one of which must be mathematics or science or an equivalent qualification such as a Nursing Certificate.

hearing has first been tested and full account has been taken of any hearing loss. Until such precautions have had time to be effective, we *recommend* further that the hearing of school children who have already been ascertained as mentally handicapped be investigated to see whether hearing defect may not be a part-cause of their apparent lack of ability.

82. In certain circumstances, speech defect, as a primary handicap, may be confused with speech defect arising as a secondary handicap from faulty hearing. We consider that all ascertainment teams working with the deaf and all those who work with speech-defectives should be constantly on the alert to prevent confusion on this point. In particular, we *recommend* that when a child is referred for the diagnosis of a speech disorder he should be given an audiometric test by the authority's audiometrician or by the school medical officer as part of the diagnostic procedure.

83. In the course of examining pupils, the ascertainment team will discover a number of cases where the hearing defect is associated with other defects. The almost infinite series of variations that may be found prevents us from giving guidance except on one general point. We consider that where seriously defective hearing is one of the handicaps it is difficult to see how any teacher other than a teacher of the deaf is capable of making an educational break-through and accordingly we *recommend* that the child concerned should be ascertained for a form of education where he can have the services of a teacher of the deaf, who may herself have other specialist qualifications or who may be working in association with others who have. Sometimes children with double or multiple defects are so severely handicapped in at least two ways that special units are required for them. In some cases, the number of children concerned might be sufficient to justify provision on a Scottish basis ; where the number of cases is very small, provision might be justified only on a United Kingdom basis.

Stages of Retesting

84. We have already emphasised that the cases of children who have been diagnosed as suffering from deafness should be kept under constant review. We consider that there are three stages in the career of such children where a review of the situation may be particularly necessary :

(a) where it is possible that he should be transferred to a class where non-oral methods of communication are taught ;

(b) where he is soon to embark on a secondary course ; and

(c) before he leaves school.

85. The following sub-paragraphs amplify the points just made :

(a) It is undoubtedly true that, despite the devoted work of their teachers, a number of pupils make little linguistic progress using oral means of communication. The question therefore arises whether a form of non-oral communication should be used for their education. A Committee "to consider the place, if any, of Finger-Spelling and Signing in the Education of the Deaf"—was set up in England by the Department of Education and Science in 1964 and we consider that it would be presumptuous for us to pronounce on this matter which is being examined by experts on the subject. We therefore *recommend* that detailed questions on ascertainment in this particular field should await the report of that

Committee in question and meantime we simply point out that an ascertainment team may be asked for guidance in regard to a particular child.

(b) It is equally obvious that the ascertainment team, with all its knowledge of the pupil's medical and educational condition, may be asked when he is nine to twelve years of age for guidance as to the type of secondary course for which he is likely to be best suited.

(c) The other stage at which guidance may be sought is where the pupil is about to leave school and it may well be that the ascertainment team, from all its knowledge, can give useful vocational guidance not only on the types of post for which the pupil may be fitted but also on the types of post for which he is quite unsuited.

86. Recently the psychologist for Donaldson's School for the Deaf, Edinburgh, has made careful investigations regarding all pupils of three age-groups in all Scottish schools for the deaf or hard-of-hearing. He has measured them in a large number of characteristics—degree of deafness, intelligence, extent of language development, etc.—and has also worked out the inter-correlations of all the many attributes he has tested. This work, shortly to be published, may be of considerable help to ascertainment teams in the predictions which they may be called upon to make regarding a pupil's future in secondary school or at work.

CHAPTER VII

Miscellaneous Items

Upkeep and Standardisation of Equipment

87. In order to diagnose hearing loss and to deal with children suffering from some degree of deafness, considerable use is made of apparatus and equipment. Some of this is delicate and may easily go wrong, especially if it is moved from place to place. We have therefore thought it advisable to express some views on the maintenance and standardisation of essential equipment. For further notes on equipment, see Appendix III.

Equipment for Testing Hearing

88. (a) Some equipment, such as rattles or other apparatus for distraction testing, is used to determine whether a very young child can hear or not. If the test is to yield a result which can be relied upon, the sounds generated by the apparatus should be standard.

(i) When, as is general today, the apparatus itself is not standardised, the tester must produce the sound (e.g., manipulate the rattle) in a standard fashion. Accordingly, it is important that health visitors or others engaged on this work should have short refresher sessions, as recommended in paragraph 66(d).

(ii) The difficulties involved in the use of non-standardised apparatus would be eliminated if suitable apparatus for emitting standardised sounds were developed and then mass-produced at a reasonable price. We understand that work is being done at various centres on devising such apparatus.

(b) At a later stage, when an attempt is made to measure accurately the extent of hearing loss in either ear and at various frequencies, the pure-tone audiometer is normally used. It produces its sounds by electric means and measures the hearing loss in decibels. Audiometers may be incorrectly calibrated when they come from the makers, or they may suffer from other faults. In one recent series of careful laboratory tests, only two out of the nine new audiometers examined were completely satisfactory; two needed adjustment and five had serious faults that required the attention of the manufacturers, involving, in one or two instances, the replacement of the instruments. This result, alarming as it may seem, is not altogether unusual in this field. Even when an audiometer is working perfectly, it may easily go out of order especially (as is said above) if it is frequently moved about. In a very recent year, only 8 per cent of the 808 audiometers sent to a laboratory for calibration were found to be in good working order. What is said above concerning pure-tone audiometers also applies, *mutatis mutandis*, to instruments used in speech audiometry. (See Appendix III.)

Equipment to help Hearing

89. In the last paragraph we have dealt with instruments that are used to test hearing. Apart from individual hearing aids, other apparatus (amplifiers, speech training and group hearing aids, sound-level meters and tape recorders) is used to help in the education of children with impaired hearing. These instruments are also subject to deterioration and damage in use. It may be thought that we, as a working party concerned with ascertainment, need not have specifically concerned ourselves with this type of apparatus. We have emphasised earlier, however, that a pupil's progress in school and in language development is of great importance to the ascertainment team, who in their periodic re-examination of the case may consider on the basis of school reports that regrading and transfer to another type of school is justified. The pupil's school progress and his acquisition of language cannot provide the clues that are necessary for proper re-ascertainment if the instruments and aids used in his education have not in fact given him a fair chance. It is therefore important that this type of apparatus be maintained in good working order.

A Service for Instruments

90. (a) To deal with the problems involved in the calibration and maintenance of apparatus, a Scottish Audiometer Calibration Service was set up in 1957 in the Regional Physics Department of the Western Regional Hospital Board at the instance of that Board and the Department of Health for Scotland. This service has brought the skills of expert physicists concerned with audiology to bear on the problems with which this section of our Report is concerned. Arrangements have now been made, however, for the Royal National Institute for the Deaf to undertake for Scotland the testing and calibration of audiometers at their Glasgow centre. The establishment of this new centre, by taking over the work of the existing Glasgow centre, will enable the latter to concentrate on the research for which it is well equipped.

(b) We strongly *recommend* that, in order that all audiometers and other important instruments are maintained in good order, they should be examined by the Calibration Service as often as the users think necessary and certainly at intervals not exceeding six months. While such testing costs money, it is worth-

while, since, without it, the costs of employing audiometricians might be incurred in vain.

Individual Hearing Aids

91. When a child is diagnosed as having defective hearing, it should at once be considered whether he should be supplied with a hearing aid. Such an aid, provided at as early an age as possible, may help him to hear the spoken word sufficiently well to enable him to develop language. If a child is ascertained to be fit, *with the help of a hearing aid*, for a particular type of education, then obviously the purpose of the ascertainment will be largely vitiated unless a proper aid is provided and is maintained in good working order.

92. We make the following comments and recommendations :

(a) Hearing aids are produced either on behalf of the Government for issue free of charge through the National Health Service or by commercial firms for sale. The Government aid (named Medresco after the Medical Research Council through which it was designed) amplifies mainly those sounds which are in the middle frequencies and, though it is particularly suited to the adult, it is satisfactory for use in many cases of deafness in children. Some commercial aids are extremely powerful and some are adaptable in that frequency response can be varied to some extent to suit the disability of the individual user. For some children who are profoundly deaf or whose hearing loss is most severe at particular frequencies, the otologist may prefer and recommend a commercial aid rather than a Medresco aid.

(b) Ear-level aids have the advantage that the apparatus is placed neatly and inconspicuously behind the ear, but they normally involve fairly expensive upkeep and tend to be less powerful than aids worn on the body.

(c) We *recommend* that the aid provided should be chosen by the otologist or other expert concerned to be the most suitable for the child.

(d) An important part of the expert maintenance required by every aid (other than a bone-conduction aid) relates to the insert into the outer ear which carries the sound waves to the eardrum. It is essential that the insert should fit the ear exactly in order that it may stay properly in position. If the insert is ill-fitting and the volume of sound is increased, "acoustic feed-back" results in a disconcerting whistle. It will readily be appreciated that, however well the insert may fit the child for whom it is made, it may cease to fit as the child grows. We therefore *recommend* that the fit should be tested at least once a year and more often in the case of babies or young children. When refitting is required it should be undertaken by a skilled technician.

(e) So far as the day-to-day maintenance of hearing aids is concerned, parents and teachers should be emphatically advised to see at the beginning of each day that the battery is in order, that the cord is intact and that "acoustic feed-back" is not occurring.

(f) The provision and upkeep of a Medresco aid is the responsibility of the National Health Service.

(g) We *recommend* that the provision and upkeep of a commercial aid, where not borne voluntarily by the parents, should be the responsibility of the public authority which provided it.

(h) We *recommend* that, when a commercial aid is required for educational purposes, its purchase and maintenance should normally be the responsibility of the education authority, who should permit the pupil to wear it out of school and to retain it on leaving school. Where a child passes from the care of one authority to another, the maintenance should become the responsibility of the authority of the area to which he has moved.

(f) The cost of the service envisaged in this paragraph is of small importance as compared with the total welfare and educational future of the children concerned.

Research

93. The task of diagnosing deafness and of determining the most appropriate form of education for which each deaf child is suited presents many great difficulties. The techniques available for this work have been built upon the experience and research of the past, but there is still much scope for further research. Much of this is appropriate to universities and to research organisations, but there are also subjects in which local authorities through their medical, psychological and teaching staffs may help, occasionally by treading new paths themselves but more often by co-operating in the work of others. We therefore consider that we are not stepping appreciably beyond our remit if we *recommend* the following (by no means exhaustive or in any special order) as subjects on which further research may help the task of ascertainment.

(a) the better standardisation of simple auditory tests for babies, so that the work which health visitors may be called upon to do may be as valid and as reliable as possible ;

(b) the development of questionnaires for the mothers of (i) babies aged six to twelve months ; (ii) children aged three to four years ; and (iii) children aged five to six years, so that the information obtained may be as helpful as possible to those engaged in planning the future of the children concerned ;

(c) the search for better and less vulnerable apparatus, particularly hearing aids, pure-tone audiometers and speech audiometers ;

(d) determination and analysis, in the case of children with impaired hearing, of the environmental and psychological factors (apart from intelligence) on which (i) scholastic progress and (ii) the child's happiness and social integration seem to depend ;

(e) the further improvement of intelligence tests for children of all ages who are handicapped by hearing defect ;

(f) further analysis—as an extension of (d) and (e) above—of the auditory, psychological, social and environmental factors which seem to prevent a child from achieving success in oral education and which may therefore determine whether a pupil's later education should be conducted mainly by (i) oral or (ii) non-oral means of communication ;

(g) a comparison of the educational and socio-emotional development of comparable children who are taught (i) in ordinary schools, perhaps with help from itinerant teachers of the deaf, or (ii) in schools for partially hearing children ;

(h) the study, through case-histories or otherwise, of the relation between degree of hearing and language progress, to discover, especially where the relation-

ship has proved to be unusual or unexpected, the factors which appear to have been involved; and to see whether the knowledge so gained might be put to use in helping future cases ;

(f) inquiry into the nature of specialised communication defects of expression or comprehension which might come under the general description of auditory imperception ;

(j) the search for further means of distinguishing cases of autism from cases of aphasia or other conditions of auditory imperception or from cases of deafness ;

(k) a retrospective study of the medical, psychological, social and educational records of pupils about to leave school to analyse the factors which have apparently determined success or lack of success, in order that the results of the analysis may be used in ascertainment when it is sought to assess how a child's various characteristics may indicate his prospective success ; and

(l) a study of vocational guidance for (i) deaf and (ii) partially hearing children.

Publicity

94. We wish to emphasise that efforts should be made to enable the general public to acquire a greater degree of interest in and knowledge of the extremely severe handicap which deafness imposes on children—a handicap which in general does not attract the sympathy and informed help which is sometimes readily given to other, often less severe, handicaps. It is even more important to disseminate increased knowledge of deafness throughout the groups and professions most closely concerned, where sympathy and knowledge tend to be restricted rather too much to the specialists. We therefore *recommend* the following :

(a) At any appropriate opportunity, the Scottish Office should advise the public, perhaps through the modern mass media, how and why a vigorous effort is being made to diagnose deafness in its varying degrees at an early age.

(b) Though the ascertainment team, and particularly the teacher of the deaf, will advise parents on the upbringing of a deaf or partially hearing child, a national pamphlet should also be prepared for issue to parents. This should be retained by them as a guide in providing for the proper social and educational development of the child. Amongst other things it should describe as simply as possible the ways in which a child can be encouraged to use his residual hearing to develop language, the care of hearing aids, the problems which may have to be faced and the services which are available to help.

(c) When comprehensive arrangements for diagnosis and ascertainment have been set up in any area, the Medical Officer of Health responsible should arrange that the general practitioners concerned are circularised to acquaint them with what is being done, in order that they may be fully aware of the arrangements which have been made and in which they should be asked to co-operate.

(d) While some infant teachers are quick to notice that a school entrant may be suffering from some degree of deafness and ensure his early examination, it is unfortunately true that some cases are not detected as soon as they ought to be. The imperative need for early diagnosis should, therefore, be emphasised by colleges of education to student teachers in training and by education authorities to teachers in service.

95. In this section of our Report we propose to deal with a subject which, strictly, is outside our remit; nevertheless the subject is so closely related to our recommendations that we are impelled to say something about it.

96. The term "teacher of the deaf" is used in Scotland to denote a person who has qualified as a teacher and who, often after teaching experience, has further qualified as a specialist teacher of the deaf. Although Scottish schools for the deaf or for the partially hearing are fully staffed (or virtually so) with qualified teachers, the teachers are, unfortunately, not all teachers of the deaf, as just described.

97. Until very recently, the only centre for training specialist teachers was the Department of Audiology and Education of the Deaf at Manchester University, which has established a world-wide reputation; but centres have now been established also at London and Dublin.

98. It is sometimes argued that the scarcity of teachers of the deaf in Scotland has arisen because of the reluctance of some Scottish teachers who might have been attracted to this work to go as far as Manchester for training. Whether this is the proper explanation or not is difficult to say—especially as a larger number of Scottish teachers have enrolled for the Manchester course for 1966/67 than in any recent year; it can certainly be argued that it is no easier for a teacher from Cornwall to go to Manchester than it is for a teacher from the central belt of Scotland. It is, in any case, essential to get more teachers of the deaf in Scotland, not only to fill all posts in our special schools but also to act as itinerant teachers of the deaf in ordinary schools and/or to provide an itinerant service of help to the parents of very young, deaf children. We therefore *recommend* that the case for setting up a training centre for teachers of the deaf in Scotland should again be fully examined.

99. It is clear from the work done at Manchester University that a department of the kind envisaged would require a range of experts in a number of fields: it must be able to call on a number of medical specialists (e.g., in otology, neurology, and paediatrics); it must have also its psychological and educational experts. The study of audiology also makes demands on physics. From this it is clear that any Scottish centre of repute would require to be able to call on the resources of a university, particularly on its fully developed medical school. At the same time, it is a Scottish tradition that the training of teachers takes place at colleges of education. This tends to suggest that, if a Scottish centre is established, it should be some kind of joint enterprise associated with both a college of education and a university.

100. A centre with a distinguished staff covering several specialisms should not be underemployed. For this reason we think that, if a centre is established, it might offer, in addition to a course for training teachers of the deaf, courses for other teachers (for example teachers of homecraft, handicrafts or physical education) who might wish to have a subsidiary qualification to make them better able to teach their subject to deaf children. Further, the centre might offer both short and longer courses with specialised aims for health visitors, audiometrists, audiologists, psychologists and medical practitioners; and also for child care staff in residential schools. The need in Scotland for *ad hoc* courses of this kind is undoubted and would certainly increase if the comprehensive arrangements which we have recommended were set up.

CHAPTER VIII

Summary or Conclusions

101. In this chapter we provide a summary of the main recommendations, observations and advice which we have set out in the course of the above Report. The references in brackets are to those paragraphs of the Report which deal with the matter summarised.

The Handicap of Deafness

(1) Arrangements for the diagnosis of defective hearing in children should be more widespread, thorough and systematic than they are (*paragraph 3*).

(2) Effort should be made to effect the first diagnosis early—as soon as possible after the child is six months old (*paragraph 3*).

(3) Advantage should be taken of early diagnosis to utilise the period of the child's life when he seems to have a natural aptitude for the acquisition of language (*paragraph 3*).

General Considerations

DIAGNOSIS AND ASCERTAINMENT

(4) When a child suffers from some degree of deafness, he requires an otological and general examination—medical, psychological and social. The results enable a team of specialists, the ascertainment team, to recommend, when the child is under two years of age, the nature of the medical, educational and social care which he should receive, and, as soon as possible after the child is two years of age, the type of education (schooling) best suited to him. Legally, the decision regarding the most suitable type of schooling—the ascertainment—is the decision of the education authority (*paragraphs 5-8*).

(5) Ascertainment should not be final but be the subject of review at reasonable intervals (*paragraphs 10 and 15*).

CLASSIFICATION AND GRADING

(6) The term “partially hearing” should be used in preference to the term “partially deaf” (*paragraph 13*).

(7) Despite the difficulties inherent in grading, some system of grading is inevitable in the work of ascertainment. A system with Grades A, B, C, D and E is recommended. A further category F is considered (*paragraphs 14, 15 and 16*).

(8) For a young child, diagnosis (otological and general) should aim at ensuring such medical attention as is required and such help to the parents as will guide them in his proper upbringing and training, especially language training (*paragraph 18*).

CRITERIA OF ASCERTAINMENT

(9) From the age of two years onwards, the question of ascertainment (grading) arises and the most fundamental criterion is the child's degree of development of language and his potentiality for further language development (*paragraph 19*).

(10) In determining language potentiality attention should be paid to :

- (a) The extent to which the child has acquired language ;
- (b) the extent and nature of his hearing loss ;
- (c) his degree of intelligence ;
- (d) his general psychological make-up ;
- (e) his human environment ; and
- (f) the progress he has already made
(*paragraph 20*).

(11) In ascertainment, regard should be had to :

- (a) the possibility of special hearing disability at particular frequencies ; and
- (b) the acoustic properties of the school to which he may be sent
(*paragraph 21*).

STATISTICS

(12) The statistics available at present regarding the ascertainment and schooling of children with defective hearing are, to some extent, unreliable and misleading ; a thorough national system of ascertainment would enable more accurate and more helpful statistics to be kept (*paragraph 23*).

INCIDENCE

(13) Figures regarding the incidence of defective hearing in children are not at present accurately known. We suggest that 1.5 children per 1,000 may require to be in special schools, classes or units ; and that a further 10 at least may require special attention in ordinary schools (*paragraph 27*).

A Comprehensive Scheme of Ascertainment and related Administrative Matters

(14) A nation wide system of ascertainment would require to be worked out on a territorial basis, each territory being a city or county or combination of these. Each territory should cover the large burghs within it (*paragraph 33*).

(15) Co-operation between health and education authorities and between these and the Regional Hospital Boards is essential. By a change in the law the education authority should be given powers to investigate and to take appropriate action in regard to children under two years of age who are suspected of hearing defect. This recommendation is basic and some of our other recommendations assume that such a change will be made (*paragraphs 45 and 46*).

(16) The key person in the administrative arrangements should be the Medical Officer of Health of the city or county to whom is assigned responsibility for the arrangements for the territory (*paragraph 33*).

(17) The ascertainment team should be a group of specialists who should consider the proper course of treatment (medical and educational) for each child referred to them ; should keep the child under review ; and, as soon as possible after the child is two years of age, should recommend (except for children in Grade A) the nature of the ascertainment (or re-ascertainment) for educational purposes which the education authority should formally adopt (*paragraphs 38 and 43*).

Some Administrative Matters

(18) The types of specialist who may be members of the ascertainment team are (in alphabetical order) the audiologist, educational psychologist, neurologist, otologist, paediatrician, psychiatrist and teacher of the deaf (*paragraph 51*).

(19) Every team should have at least four permanent members :

the Medical Officer of Health in charge of the arrangements, or a medical officer employed by one of the authorities within the territory and chosen by him ;

a teacher of the deaf ;

an educational psychologist, and

an otologist

(*paragraph 52*).

(20) Other specialists (from the list given) may be members of the team, serving as required ; or they may simply be consulted as necessary. In particular cases (e.g., where some form of imperception is suspected) the team may invite the help of still other specialists, not necessarily available locally (*paragraphs 42 and 53(e)*).

(21) An ascertainment register should be maintained of all the cases referred to the team ; and an ascertainment record should be kept for each case (*paragraphs 40, 49, and 53(h)*).

(22) The medical officer in charge of the arrangements should ensure that the team keeps its cases under review and that all necessary information is sent to the Director(s) of Education, the family doctors, the parents and the schools concerned (*paragraph 49*).

PREMISES

(23) Comment is made on the suitability of rooms of various types for use when hearing is tested (*paragraphs 55-60*).

(24) Since many children with some degree of hearing loss are educated in ordinary schools, more attention should be given, when new buildings are planned, to the acoustic conditions which they will provide (*paragraph 61*).

Children Under Five

(25) Defective hearing in young children may be suspected by the parents or by the family doctor (*paragraph 35*), but public authorities should play their part in seeking out cases (*paragraph 64*).

(26) Public authorities should play their part by ensuring the preliminary screening of young children. This work should be undertaken by health visitors (*paragraphs 36 and 65*). Those concerned should be trained for the work (*paragraph 66*).

(27) An " at risk " register should be kept in each area (*paragraph 34*), but all children should be screened, whether on the register or not, as soon as possible after the age of six months (*paragraphs 67 and 68*).

(28) All children suspected of hearing defect, whether reported by the parent, family doctor or health visitor, should be screened by a medical officer chosen for this work (*paragraph 69*).

(29) Cases confirmed by the medical officer and cases of doubt should be referred to the ascertainment team, for action, when necessary, as in item (17) above (*paragraph 70*).

(30) The tests given to young children are distraction tests (*paragraph 64 and Appendix III*). From age three years onwards, audiometry may be possible. This should be carried out by a competent person (*paragraph 72*).

(31) As soon after age two years as possible, the child with impaired hearing should attend a nursery school, which may, according to the advice of the ascertainment team, be either the nursery department of a special school for the deaf or an ordinary nursery school. Such attendance gives further clues concerning the appropriate later education (*paragraph 73*). A sufficiency of places in nursery schools should be created or reserved for children with defective hearing (*paragraph 74*). Any child of deaf parents should be provided at an early age with environment that will stimulate speech (*paragraph 77*).

(32) Ascertainment as distinct from diagnosis may become possible from age two years onwards (*paragraphs 43(b) and 75*).

(33) When some degree of deafness has been confirmed, the parents should be told and their duties to the child emphasised (*paragraph 76*).

(34) When some degree of deafness is discovered, the case should be notifiable in the same way as cases of some infectious diseases (*paragraph 77*).

Children Over Five

(35) All children between the ages of five and six years should be given an audiometric sweep frequency test by a competent person. Two further sweep tests should be undertaken (*paragraphs 78 and 79*).

(36) Cases of impaired hearing should be kept under review, with re-ascertainment (regrading) as necessary. For this purpose, school reports are important (*paragraph 80*).

(37) No pupil should be ascertained as mentally handicapped unless his hearing has first been thoroughly tested. Children already so ascertained should also have their hearing tested, if this has not already been done (*paragraph 81*).

(38) All children examined for speech disorder should be given an audiometric test (*paragraph 82*).

(39) A child with two or more handicaps, of which serious deafness is one, should be ascertained for a form of education where he can have the services of a teacher of the deaf (*paragraph 83*).

(40) While all children on the ascertainment register should be kept under review by the team, review is specially necessary (a) where a child is to be transferred to a class where non-oral methods of instruction are to apply; (b) where he is soon to embark on secondary education; and (c) before he leaves school, when the team may give useful vocational guidance (*paragraph 84*).

Miscellaneous Items

EQUIPMENT

(41) It would be an advantage if apparatus for distraction testing could be developed to emit only standardised sounds (*paragraph 88*).

(42) Pending the production of such apparatus, those engaged on distraction testing should have refresher courses from time to time in order that they may restandardise their technique (*paragraph 88*).

(43) In order that all audiometers and other important instruments are maintained in good order, they should be examined as often as the users think necessary and certainly at intervals not exceeding six months (*paragraph 90*). The Scottish agency for this work is the Royal National Institute for the Deaf, Glasgow (*paragraph 90*).

(44) The hearing aid for a deaf child should be selected by the otologist or other expert. The fit of the insert should be tested at least once a year (*paragraph 92*).

(45) Parents and teachers should be advised concerning the day-by-day examination of hearing aids (*paragraph 92*).

(46) The provision and upkeep of a commercial aid, when not borne voluntarily by the parents, should be the responsibility of the public authority which provided it (*paragraph 92*).

(47) Where a commercial aid is required for educational purposes, its purchase and maintenance should be the responsibility of the education authority (*paragraph 92*).

RESEARCH

(48) A list of research subjects is given (*paragraph 93*).

PUBLICITY

(49) When national ascertainment arrangements are made (or at any other suitable opportunity) they should be publicised by the Scottish Office (*paragraph 94*).

(50) A national pamphlet should be prepared to help the parents of children with defective hearing (*paragraph 94*).

(51) General practitioners should be made fully aware of, and asked to co-operate in, any national arrangements (*paragraph 94*).

(52) The need to detect early any hearing defects in their pupils should be emphasised to student-teachers and to teachers in service (*paragraph 94*).

A SCOTTISH TRAINING CENTRE

(53) Consideration should be given to the establishment of a Scottish Centre for training teachers of the deaf and for providing other courses of short or longer duration for other workers in the field of defective hearing (*paragraphs 95-100*).

ACKNOWLEDGEMENT

102. In concluding our Report we wish to record our indebtedness to our Secretary, Mr A. W. M. Heggie, and our Assistant Secretary, Miss A. M. J. Hutchison, for the excellent services we have received from them. They arranged our meetings and prepared our minutes ; they made arrangements with our expert witnesses for our interviews with them and recorded the evidence, however technical it might be. They also obtained information for us from a variety of sources and Mr Heggie, at a critical stage in our work, produced for us a most useful summary of a complicated mass of facts and opinions. We thank them warmly.

We have the honour to be, Sir,

Your obedient Servants,

(Signed) A. G. RODGER (*Chairman*)
 J. F. BIRRELL
 J. FULTON CHRISTIE
 R. B. FORBES
 S. HARVEY
 W. JEFFREY
 HUGH B. JONES
 T. McLAREN
 MARGARET MARTIN
 NORA I. WATTIE
 DAVID S. PETRIE
 J. A. WARD
 A. W. M. HEGGIE (*Secretary*)

St. Andrew's House,
 Edinburgh, 1.
 6th December, 1966.

APPENDIX I

List of Organisations and Individual Persons who submitted Evidence

NOTE: Those marked with an asterisk gave written evidence only and those marked with a dagger gave oral evidence only; the rest gave both written and oral evidence. Oral evidence was given by organisations through the representatives named.

A. ORGANISATIONS

- *Association of School Medical and Dental Officers of Scotland.
- *British Association of Otolaryngologists.
- *British Medical Association (Scottish Council).
- Mission to the Adult Deaf and Dumb for Glasgow and West of Scotland—
Reverend J. Stewart Lochrie.
- *National College of Teachers of the Deaf (Scottish Branch).
- National Deaf Children's Society:
 - West of Scotland Region —Mr W. G. M. Carruthers.
 - North and North East Scotland Region—Mr D. Dinnie.
 - East of Scotland Region —Mr R. Mowat.
- Scottish Association for the Deaf—Mr J. F. Montgomerie.
- *Scottish Health Visitors' Association.
- *Scottish Otolaryngological Society.
- *Society of Medical Officers of Health (Scottish Branch).
- *St. Vincent's After-Care Society for the Deaf—Reverend D. O'Farrell.

B. INDIVIDUAL PERSONS

- Dr R. W. Bailie, Otologist, Royal Alexandria Infirmary, Paisley.
- Dr A. K. Bain, Otologist, Ear, Nose and Throat Hospital, Glasgow.
- Mrs E. Beattie, Audiometrician, Ear, Nose and Throat Hospital, Glasgow.
- †Dr W. C. Brown, Otologist, Royal Hospital for Sick Children, Glasgow.
- Dr E. A. M. Connal, Otologist, Hearing Aid Clinic, Ear, Nose and Throat Hospital, Glasgow.
- Dr M. Dunn, School Health Service, Glasgow Corporation.
- Professor-Emeritus Sir Alexander G. W. Ewing, formerly of the Chair of Audiology and Education of the Deaf at Manchester University.
- Dr L. Fisch, Otologist, Royal National Throat, Nose and Ear Hospital, London.
- Mr L. E. Heath, Headmaster, St. Giles School, Edinburgh.
- Dr T. T. S. Ingram, Department of Child Life and Health, Edinburgh University.
- *Dr M. Joels, Otologist, Royal Hospital for Sick Children, Glasgow.
- Miss E. C. Knox, Senior Physicist, Western Regional Hospital Board, Glasgow.
- Dr J. M. A. Lenihan, Regional Physicist, Western Regional Hospital Board, Glasgow.
- Mrs A. M. McMillan, Speech Reading Unit, Glasgow Education Authority.
- Miss E. H. B. Mitchell, Educational Psychologist, Glasgow Education Authority.
- Mr G. W. G. Montgomery, Educational Psychologist, Donaldson's School for the Deaf, Edinburgh.

- †Mr J. Mowat, Otologist, Royal Infirmary, Dundee.
 Miss A. C. Purdie, Audiologist, Glasgow Education Authority.
 Mr M. Reed, Inspector of Special Education, Inner London Education Authority.
 Mr T. M. Scott, Headmaster, Parkhouse School, Glasgow.
 Professor I. G. Taylor, Department of Audiology and Education of the Deaf, Manchester University.
 Mr I. S. D. Thomson, Otologist, Royal Hospital for Sick Children, Aberdeen.
 *Dr W. M. Walker, General Practitioner, Glasgow.
 *Miss Edith Whetnall, Royal National Throat, Nose and Ear Hospital, London (died 23rd October 1965).

APPENDIX II

Common Terms in the Physics, Physiology and Psychology of Sound, Hearing and Deafness

GENERAL

1. Sounds are a characteristic part of the psychological life of animals and man. Sounds always originate as vibrations (for example, in an oscillating violin string) in the external world. The effects of the vibrations are carried by physical means (normally as waves in the air) to the ear. In this complex physiological organ, processes are set up which are transmitted through the auditory nerves to the region of the brain which specialises in their reception. Awareness of a sound (i.e., hearing) is a psychological event : with practice we come to differentiate or perceive sounds.

THE PHYSICS OF SOUND

2. A body vibrating at a constant frequency produces a note of definite pitch. The greater the frequency the higher the pitch of the note.

3. When note A above middle C on a piano is struck, the string vibrates as a whole, at 440 cycles per second, to produce the fundamental note A. But simple fractions of the string also go into vibration at their own characteristic frequencies (e.g., the two halves of the string at a frequency of 880). These sub-vibrations produce sounds that are higher than the fundamental note ; they blend pleasantly with it as their frequencies bear a simple relationship to the frequency of the fundamental note. Such subsidiary sounds are called overtones or harmonics because (as the musicians say) they are in harmony with the fundamental note.

4. If a note is sounded which has no overtones, it is called a pure-tone.

5. When the same note is sounded on a piano and on a violin, the fundamental notes are alike, but the two instruments produce different overtones. It is through differences in overtones that we can distinguish between instruments (or voices) producing the same fundamental note. The characteristic quality of a particular instrument or voice or sound is called its timbre and is determined largely by the overtones.

6. When random notes of different pitch are produced simultaneously, the notes are not normally in harmony and result in a discordant sound or noise. The roar of traffic is an example.

7. A vibrating body impinging on the air in contact with it sets up waves in the air which travel outwards in all directions at a constant speed. The speed of sound in air at 0°C is approximately 1,100 feet per second. It is the same for sounds of different pitch, which explains why the high and low notes played simultaneously by a brass band are heard simultaneously at a distance. The velocity of sound (V), which is the same for sounds of different pitch, the frequency (f)

which determines the pitch, and the wave-length (w) of the air waves are connected by the law, $fw = V$. Sound travels at different speeds in different media, and does not travel at all in a vacuum, since there is no medium to carry the waves.

8. If a violin note is played gently, the oscillations of the string are gentle ; if the note is vigorously played, the oscillations are vigorous. The strength of the oscillations of the body producing the sound determines the intensity.

9. To sum up : these three attributes of a sound—its pitch, its quality and its loudness—depend respectively upon the fundamental frequency, the overtones and the strength of the physical vibrations which give rise to it.

THE ANATOMY OF THE EAR AND THE PHYSIOLOGY OF HEARING

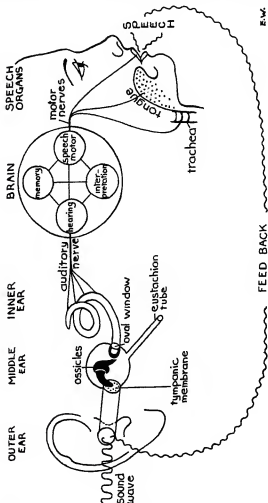
10. The ear consists of three parts—the outer ear, the middle ear and the inner ear. The outer ear, which includes the visible parts, collects sound waves from the air which pass down the ear passage. At the end of the passage they impinge on the tympanic membrane, sometimes called the ear drum or more correctly the drum head. The membrane separates the outer ear from the middle ear—a small cavity ventilated from the back of the nose through the Eustachian tube (to preserve equal atmospheric pressure on both sides of the drum). The cavity is air-filled and contains three tiny bones (ossicles) connected as a lever system to transmit movements of the tympanic membrane produced by sound waves to the oval window, which separates the middle ear from the inner ear. The organ of hearing in the inner ear is the cochlea which contains fluid in contact with the inner side of the oval window. Vibrations of the oval window are transmitted through the cochlear fluid to nerve receptors in the cochlea which respond to the frequency of the vibrations. Nerves from these receptors carry impulses to the brain which interprets them as a sound with a certain pitch, timbre and loudness. The complex wave pattern of speech sounds produces a pattern of nerve impulses to which the brain learns by experience to attach some particular significance. The brain stores this pattern in memory, and when it is received again it is recognised.

11. The ear passage and the middle and inner ear are embedded in a complex portion of the bone of the skull. This bone (together, indeed, with the whole skeletal structure) can carry sound vibrations, e.g., from the floor, to the cochlea. Part of the totality which we call "hearing" arises from this bone conduction of sound. When disease interferes with the normal passage of sound through the outer and/or middle ear, bone conduction may be used to provide an alternative though inferior pathway.

12. It is part of the phenomenon of human and animal behaviour that, provided the appropriate nerve pathway is intact, a stimulus will evoke some kind of response. The baby's earliest visible response to a sound stimulus is the startle reaction. At a later stage he begins to show awareness of sounds by expressing pleasure or its opposite and by looking for their source. A further development of auditory perception is to attach meaning to the sounds ; eventually he understands the complex sounds which are speech. The final development is to use speech as a means of communication.

13. The brain during the early childhood years develops the complex physiological connections which permit speech sounds to be received and interpreted. Other connections from higher thought centres to the speech motor centre in the

brain, and thence to the larynx, tongue, cheeks, jaws and lips, permit a reply to be made. While we speak our ears hear a feed-back of the sound of our speech to monitor it and modify it if needed. To show such a complex process diagrammatically is to over-simplify, but the rudiments of the anatomy and physiology involved are illustrated below in the drawing prepared by Dr Elizabeth Ward.



14. Deafness, partial or severe, may arise if any part of the hearing system fails to develop adequately or is damaged or destroyed by disease. The defect may occur (a) in the outer or middle ear (conductive deafness) or (b) in the inner ear or the nerves running from the cochlea (perceptive deafness), or (c) in the brain (central deafness). Congenital hearing defects are usually due to imperfect development of the cochlea (as occurs when the mother has had rubella early in pregnancy) or to damage to the auditory nerve or auditory centre in the brain (as can occur in neo-natal jaundice caused by rhesus factor incompatibility). From birth onwards a child's hearing may be impaired to a greater or lesser degree by a variety of causes, temporary and remediable or permanent. Wax may be impacted in the outer ear ; catarrhal and inflammatory conditions may affect the middle ear ; or the cochlea or the auditory nerve may be involved in inflammatory conditions such as meningitis or encephalitis or in head injuries.

15. A very important type of partial deafness is known as high-tone deafness. The person suffering from this is able to hear fairly normally sounds with a frequency of up to 500 or 1,000 cycles per second, but at higher frequencies is able to hear only loud sounds. The importance of this condition is that vowel sounds, which are relatively low-pitched, may be heard fairly well, whereas certain consonants of higher pitch are not heard at all. To the untrained observer the child appears to hear, but he cannot develop recognisable speech because he cannot learn the sounds of many important consonants, and has difficulty in distinguishing words with the same vowel sound but with different consonants. The frustration which high-tone deafness causes may produce severe disorders of behaviour which may be confused with autism (see below).

16. There are some conditions which may be mistaken for deafness, in which a child fails to speak or is abnormally slow to speak, but in which it is possible to show that sound is received by the ear and conducted by the auditory nerve to the brain. Because of some factor within the brain the child cannot develop the ability to attach a meaning to a sound ; or because of failure to develop the nerve pathways between the hearing centre and the portion of the brain which initiates speech he cannot respond to the sound by imitation. Both these conditions are described as aphasia, which may be receptive where the sound has no meaning ; or expressive where the response is impossible to make. Other terms used for these conditions are respectively auditory imperception and developmental speech defect. In both of these, the development of speech is delayed and imperfect rather than absent altogether ; but as the child's speech contains confused and imperfectly formed words it may closely resemble the speech of a hard-of-hearing child. In recent years there has been increasing interest in another form of handicap, viz., autism, which may be confused with deafness or aphasia since all of these lead to communication difficulties. The autistic child lives in a world of his own, is unable to form relationships with other people, and therefore does not communicate by speech, even though he can make noises with his vocal mechanism, and may be shown to hear normally. The bizarre behaviour of autistic children may also be confused with the frustrated behaviour of an intelligent deaf or partially deaf child who cannot make himself understood.

17. This description of the process of hearing and of the types of deafness and conditions with which it may be confused is by no means comprehensive, but it

may demonstrate to the reader the reason for our recommendation that the study of children with communication difficulties should be in the hands of experts.

18. The following is a list of terms commonly in use in the field with which the Report has been concerned ; references are freely made to the earlier paragraphs of this Appendix.

GLOSSARY OF TERMS

"At Risk". If the family history of a child or the history of his pre-natal conditions, birth or early life, are such as to increase substantially the risk of his suffering from a handicap (e.g., deafness), he is said to be "at risk". Only a minority of such children in fact suffer from a handicap.

Aphasia. See 16 above.

Audiometer. See Pure-tone audiometer and Speech audiometry. (See also Appendix III).

Audiogram is a graphical representation of a person's acuity of hearing in either ear, at different frequencies.

Auditory imperception. See 16 above.

Auditory perception. When a normal baby is very young, he hears, but the sounds have no meaning for him. Gradually he learns to associate meanings with various sounds : he can distinguish different voices, the telephone bell, etc. ; he can distinguish loud from quiet sounds, sounds of different pitch and timbre ; he can tell whether a sound comes from the left or right, front or back. When he has learned to give some meaning to sound sensations, the sensations have become percepts.

Autism. See 16 above.

Bone-conduction. See 11 above.

Cochlea. See 10 above.

Deafness—Conductive, Perceptive and Central. See 14 above.

Decibel. Loss of hearing is normally measured on the decibel scale. The degree of loss in a particular ear at a particular frequency is given by d where

$$d = 10 \log_{10} \frac{I_p}{I_n}, \text{ and}$$

where I_p is the least intensity of sound at the particular frequency that the person tested can hear (in the ear being tested) and I_n is the least intensity which can be heard by a normal person.

It will be observed that the scale used is logarithmic so that a decibel loss of 20 or 30 decibels means that the patient can hear sounds only if their intensities are 10^2 or 10^3 (i.e., 100 or 1,000) times as great as those just heard by the ordinary person.

It has also become common to express the loudness of sounds in terms of decibels. Normally a whisper is about 30 decibels louder (i.e., it is produced by a physical intensity 1,000 times greater) than the quietest sound that the normal ear perceives ; conversation is about 60 decibels (i.e., 1,000,000 times), a shout is about 90 decibels (1,000,000,000 times), and a noise loud enough to produce discomfort is about 120 decibels louder (i.e., 1,000,000,000,000 times greater) than the least sound perceptible by the ordinary person.

Developmental speech defect. See 16 above.

Distraction testing. Babies cannot be expected to make a co-operative effort to help the examiner who, therefore, relies mainly on distraction tests which seek to compare approximately the sounds which are sufficient to distract the baby and the sounds which would distract a normal baby. (See also Appendix III.)

Ear drum or tympanic membrane. See 10 above.

Frequency is the speed of the vibration of the body producing a sound ; thus a tuning fork producing the note A above middle C vibrates 440 times a second, which is the frequency. A complete vibration is often called a cycle, and frequencies are quoted in cycles per second. See 2 above.

Harmonics or overtones. See 3 above.

Harmony is produced when two simultaneous sounds blend pleasantly with one another. The frequencies of the two sounds bear a simple arithmetical ratio to one another. See 3 above.

High-tone deafness. See 15 above. (See also Appendix III.)

Intensity. The intensity or strength of the vibrations producing a sound determine the loudness of the sound heard.

Loudness is the attribute of a sound which depends upon the strength of the vibrations producing it.

Noise. A noise is produced when, at the source, sounds are emitted simultaneously of more than one fundamental frequency and when the fundamental sounds do not harmonise with one another. See 6 above.

Overtones or harmonics. See 3 above.

Perception. The baby sees " but knows not what he sees " ; he hears but the sounds have no meaning. Thus the baby has a wide range of items of awareness (sensations) derived from his sense organs, but it is only with experience that his sensations develop meaning : a particular " view " is recognised as his mother's face, a particular sound as his mother's voice. A sensation which carries meaning is a percept ; the stage of perception is reached as soon as sensations begin to mean something.

Pitch of a sound is its highness or lowness. It depends on frequency. See 2 above.

Pure-tone. A pure-tone is a musical note without overtones. See 3 and 4 above.

Pure-tone audiometer. An audiometer is an instrument used for measuring hearing defect. It produces by electric means pure-tones at a range of frequencies and intensities which can be selected by the operator. See Appendix III.

Quality or timbre. See 5 above.

Sound. See 1 above.

Speech audiometry. See Appendix III.

Threshold. The term " threshold " is used in psychology to denote the point at which the individual becomes aware of a stimulus of a certain kind. The least loud sound of a given frequency which the normal person can hear is his threshold—the threshold of audibility. The difference between the threshold of a person with hearing defect and that of a normal person is the basis of measuring his hearing loss in decibels. Thresholds (of intensity) may differ for sounds of different frequency.

Timbre or quality. See 5 above.

Tone. A tone is produced when a vibrating body vibrates at one fundamental frequency. Normally the body also produces related overtones. See 3 above.

Tympanic membrane or ear drum. See 10 above.

Wave-length. See 7 above.

APPENDIX III

Tests and Test Procedures

1. We have emphasised in Chapter II that the expert assessment of the educational needs of a child suspected of hearing defect must be a balanced judgement of a number of factors and we set out below a more detailed account of the processes which might be employed in this assessment.

SCREENING TESTS OF HEARING

2. These tests (commonly called distraction tests) have evolved from studies of the reactions to sound of babies from birth onwards. During the first few months of life the reflex responses which can be evoked to different forms of sound stimuli give positive evidence of some capacity to hear, but, as the sounds used have to be fairly loud, it is not possible at this stage to say with certainty that a baby's hearing is normal. Gradually the baby begins to exhibit a growing awareness of the sounds in his environment and, at the age of three to four months, begins to demonstrate his ability to listen. One of the milestones in learning to hear is attained when the baby shows by turning his head to left or right that he has learned to look for and to locate *quiet* sounds. It is only when this stage is reached, at the age of six to nine months for most babies with normal hearing, that the screening tests suggested in Chapter III for the whole infant population can be undertaken.

3. The following is a brief outline of the screening tests used by the Department of Audiology and Education of the Deaf in the University of Manchester.

Infants Aged About Seven to Eighteen Months

Test 1. Sentence of not fewer than eight syllables spoken continuously at minimal voice level (not whisper) with lively intonation and rhythm—e.g., "Look at the lovely toy I've got here."

Test 2. High pitched rattle gently and slightly rotated.

Test 3. Vowel "oo" repeated as if in a spoken sentence not fewer than eight times at minimal voice level and with lively rhythm and attractive intonation.

Test 4. Rhythmic repetition of consonant "s" normally articulated and with varying and lively rhythm.

Normal hearing is indicated if the infant makes decisive, positive responses, on both right and left sides, to Tests 1 and 3 and to at least one of the Tests 2 and 4.

Children Aged Eighteen Months to Five Years

When children older than eighteen months who are suspected of hearing defect are referred for testing it is important to be able to assess their hearing with reference to normal standards. Tests, similar to the screening tests for babies and covering a number of age ranges between eighteen months and five years, have been evolved for this purpose. As most children who hear normally have, by the age of eighteen months, begun to comprehend speech, many of the tests used are based on the child's capacity to respond to speech. Another form of test applicable from the age of two years nine months onwards, mentioned because of its usefulness also in diagnostic and audiometric testing, is a type of performance

test. The child is trained to carry out some simple repetitive activity using toy material, e.g., putting pegs in a peg board, in response to a sound stimulus. When the procedure has been firmly established the technique can be used with a wide variety of sound stimuli used for testing, including speech sounds and the tones of the audiometer.

DIAGNOSTIC TESTS OF HEARING FOR YOUNG CHILDREN

4. Where the screening tests already outlined suggest that a child may be suffering from hearing loss, diagnostic testing is undertaken. This involves a repetition of the screening tests together with further tests involving a wide variety of other sounds which may help to arouse the child's interest. The usual procedure is to begin with quiet sounds and gradually increase the intensity until a response is evoked. A sound-level meter is essential to measure this intensity and to monitor the loudness of the voice, speech or other stimuli used during subsequent stages of testing. Below the age at which a pure-tone audiometric test can be attempted, calibrated pitch pipes, used in conjunction with a sound-level meter, or a free field audiometer which delivers its tones via a small loudspeaker, often give a useful picture of the degree of hearing loss at different frequencies.

5. To introduce a higher degree of standardisation, a number of centres now use recorded sounds, which are relayed through calibrated, amplifying equipment to one or more loudspeakers situated in the testing room. As the recorded sounds must bear a close resemblance to the real sounds, good quality recording and reproduction are essential.

6. While the chief aim in diagnostic testing is to discover as much as possible about the child's hearing, it is also important to find out how well he uses such hearing as remains to him, particularly in regard to the reception of speech, and how any hearing functions at suprathreshold levels.

PURE-TONE AUDIOMETRY

7. The pure-tone audiometer has remained, since its development in the 1930s, the standard instrument for the testing of hearing. Audiometers vary in the facilities they offer, and in their complexity, from the comparatively simple instrument used in the sweep frequency testing of children in ordinary schools to the Békésy type of audiometer which is highly automated.

8. An average instrument provides a series of tones having the following frequencies—250, 500, 1,000, 1,500, 2,000, 3,000, 4,000, 6,000 and 8,000—at levels of intensity adjustable in 5 decibel increments from -10db. to a maximum of 100-110 db. Audiometers are calibrated so that 0 db. represents the point at which, on average, the normal young adult listener would just begin to hear the tone. An international standard for this threshold has been established.

9. The purpose of an audiometric test is to determine, for both ears of the individual being tested, the point on the decibel scale at which sound is just beginning to be heard. This threshold is established for each of the tones presented and the audiogram which is then drawn gives an accurate assessment of the individual's hearing, expressed in terms of decibels, relative to people with normal hearing.

10. The audiometric testing of adults and of older children whose hearing is not grossly defective presents no particular difficulties. The testing of young

children, however, requires considerable skill in child management, as reliable results can be obtained only if the child is at ease in the test situation and shows willingness to co-operate.

SCREENING TESTS OF HEARING IN ORDINARY SCHOOLS

11. What is known as the "Sweep Frequency Test" has superseded other forms of testing designed to screen out children with defective hearing in ordinary schools. In this test, which is administered to children individually, the pure-tone audiometer is used with the intensity control set at a pre-determined level (usually 15-20 db.). The operator then "sweeps" through those frequencies known to be of the greatest importance in listening to speech (usually 250 or 500 in octave steps to 4,000), testing each ear separately. Children who fail to respond to any one frequency (or in some surveys, to any two frequencies on either side) are adjudged to have failed the test and are, therefore, referred for further investigation.

SPEECH AUDIOMETRY

12. A study of the pure-tone audiogram can yield much useful information about a child's capacity to hear speech, but it tells us little about the child's capacity to discriminate and to understand speech. This information, which is of the greatest educational importance, can be obtained through the application of audiometric techniques with speech as the sound stimulus.

13. Tests using specially compiled lists of monosyllabic words have been found to be useful in assessing the individual's capacity to discriminate speech sounds. Many such lists have been evolved for the testing of adults. For children below the age of eight years the Manchester Junior Word Lists devised by Dr T. J. Watson are suitable whilst, for children over the age of eight years, lists prepared by Professor D. B. Fry may be used.

14. To test the comprehension of speech more thoroughly, sentence material is used. Some of the standard sentence-lists of this type can be used with older children with partial hearing, but their vocabulary is too difficult for young children. Sentence-lists for use with younger children have, however, been prepared at Manchester University by Dr T. J. Watson and may be used in cases of slight to moderate hearing loss.

15. A variety of instrumentation may be used for speech audiometry, the two main requirements being a means of monitoring the input, i.e., the speech used, and a means of measuring the output, i.e., the intensity at which the listener hears. Live voice monitored by a sound-level meter, used in conjunction with speech training or group hearing aids whose output is calibrated, can give useful results, but a greater degree of standardisation is achieved if recorded speech is used. A simple method of achieving this is to record the material on tape and then replay it through an audiometric attachment which controls the intensity of the output, the child listening through a high quality headset.

TESTS OF LINGUISTIC DEVELOPMENT

16. For educational purposes, as has been indicated in Chapter I, the most serious handicap of deafness, or partial deafness, in children is the limitation it places on the normal growth of language. Tests of speech comprehension, which form an integral part of the programme in testing the hearing of young children, provide information not only about a child's hearing but also about his language

development. When the tester considers that any deviation from normal linguistic growth, as shown by the child's capacity to comprehend speech and to talk, cannot be accounted for solely by his hearing loss, the tests of speech comprehension can be extended to explore the range of vocabulary he understands. Also if the child can talk, tests to explore the range of vocabulary he uses can be administered.

17. For older children whose hearing handicap is not severe, tests of vocabulary, which provide a measure of the child's linguistic progress, can be given. Two of the best known tests for this purpose, both devised by Dr A. T. Watts, are the Holborn Vocabulary Test for children aged five to nine years and the Common Names Test for children aged ten to fifteen years.

RECRUITMENT

18. Recruitment is the name given to a curious phenomenon which affects some of these persons whose defective hearing is due to a disorder within the cochlea. When recruitment is present no sound is heard up to the individual's threshold but, above that threshold, the sensation of loudness increases very rapidly ; only a few decibels above threshold, the sound may be heard as loudly as by people who hear normally.

19. What is known as the " Fowler Loudness Balance Test " is widely used for the detection of recruitment and facilities for administering this test are included in the specification of a number of audiometers. This test is not, however, suitable for young, deaf children. A number of other tests which require specialised equipment, but which are suitable for children, have been developed in recent years.

20. The effects of recruitment may be distressing, as the difference in intensity between sounds which can just be heard and these which are uncomfortably loud is very small. Recruitment also adds to the difficulty of using a hearing aid. Where an aid is fitted it should be of a type incorporating automatic volume compression—a device within the hearing aid which reduces the intensity of very loud sounds.

INTELLIGENCE AND ATTAINMENT TESTS

21. Intelligence testing aims at estimating potential rather than achievement ; and in a prediction of this sort, the margin of error, whether or not the child is handicapped, may be considerable. This Appendix deals only with those aspects of the problem which arise when a degree of hearing loss is present. The central difficulty is the extent and the manner in which allowance may be made for linguistic deprivation. Language and the higher cognitive processes are inextricably interwoven. In intelligence tests which are wholly or in part verbal, the deaf child is immediately at a disadvantage. This had led, in the past, to an attempt to measure the intelligence of deaf children by means of non-verbal tests ; but reliance on the so-called " performance " tests raises other problems. In the first place, although the test is presented in terms of non-verbal symbols or situations, the solution may be arrived at more effectively through verbalisation. For instance, there is considerable evidence to show that deaf children perform more poorly than might be expected in the Raven Progressive Matrices. Secondly, performance tests may be unreliable if used as predictors of success in schools with a verbally biased curriculum. Askew (" Teacher of the Deaf ", Vol. LXII, No. 374) has produced evidence to show that reliance on non-verbal tests could result in

the acceptance of candidates of high ability who would, nevertheless, be likely to do badly in the traditional grammar school type of course.

22. Further questions arise in deciding at what stages of the child's development psychometric measurement should be undertaken. The importance of early assessment has already been stressed. Unfortunately, intelligence tests for young children tend to have restricted prognostic value. Most are American—a fact which in itself renders them of doubtful value under British conditions—but the Griffiths scale, in addition to being well standardised, has British norms. The use of such tests requires a trained person, preferably with experience of young, deaf children.

23. The child who has been ascertained as requiring special educational treatment because of auditory handicap and has entered a special school requires further psychological assessment. Ascertainment is a continuing process. As there is little value in continually contrasting the child's ability and attainment with norms for hearing children, it is better to use tests which have been standardised on comparable children.

24. The following tests are widely used in the assessment of the intelligence of deaf and partially hearing children :

Raven Coloured Progressive Matrices.

Sets A, Ab and B, 1947. For ages 5-11 years. See "Progressive Matrices" by J. C. Raven. (H. K. Lewis & Co., 1947.)

Griffiths Mental Development Scale.

For children from birth to 2 years. See "The Abilities of Babies" by R. Griffiths. (University of London, 1954.)

Merill-Palmer Scale of Mental Tests. Latest Revision 1931.

For ages 24-63 months. See "Mental Measurement of Pre-School Children" by Rachel Stutsman. (World Book Company, New York, 1953.)

Nebraska Test of Hearing Aptitudes for Young Deaf Children.

For children 3-11 years. By M. S. Hiskey. (University of Nebraska, 1941). (Test standardised on deaf and partially deaf children.)

Wechsler Intelligence Scale for Children (The "WISC"), 1949.

For ages 5-15 years. Manual with material supplied by the National Foundation for Educational Research in England and Wales. Norms for Scottish children aged 5-11 years prepared by Scottish Council for Research in Education. (Performance scale only for deaf children.)

Drever-Collins Performance Test of Intelligence.

A series of non-linguistic tests (Drever-Collins Battery) for deaf and normal children, 5-16 years by J. Drever and M. Collins. (Oliver and Boyd, Edinburgh, 1946.) (Test standardised on deaf and partially deaf children.)

Columbia Mental Maturity Scale.

Manual by B.B. Burgemeister, L. M. Blum and I. Lorge. (World Book Company, New York, 1954.) (For cerebral palsied children who are also deaf.)

Non-Verbal Intelligence Tests for Deaf and Hearing Subjects, (Snijders-Oomen non-verbal scale).

For children 24-16 years by J. Th. Snijders-Oomen. (Wolters, Groningen, Holland, 1959.) (Test standardised on deaf children.)

Ascertainment of Children with Hearing Defects

*Report of the Working Party
appointed by the Secretary of State
for Scotland*

EDINBURGH
HER MAJESTY'S STATIONERY OFFICE

1967

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- * Dr. Ward succeeded Dr. W. W. Sinclair as assessor on 8th December 1965. Up to that time
Dr. Ward had been a member of the Working Party.

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TO THE RT. HON. WILLIAM ROSS, M.B.E., M.P.,
Secretary of State for Scotland.

SIR,

Introductory

You appointed us as a working party in December 1964 with the following remit :

“ To consider what guidance should be offered to education authorities in ascertaining children who, because of defects in hearing, are in need of various forms of special educational treatment.”

We held our first meeting on 26th January 1965 and, after twenty-four meetings of the full Working Party and ten meetings of a drafting sub-committee (each lasting a day), we now have the honour to submit the following Report.

In submitting the Report, we wish to acknowledge gratefully the help we have received from those who submitted written evidence to us and those who appeared before us to give oral evidence (they are listed in Appendix I) ; Mr Jeffrey (one of our own members) and Miss Scott, both of Donaldson's School for the Deaf, who demonstrated the testing of young children ; Dr. T. T. S. Ingram, Royal Hospital for Sick Children, Edinburgh, who demonstrated electroencephalographic audiometry ; and officers of the Scottish Education Department and of the Scottish Home and Health Department for information and statistics on matters that were of importance to us.

It was obvious to us that we should acquaint ourselves with the main research work that had been done in our field and with the most important earlier reports relating to our subject. We are therefore indebted, possibly to a greater extent than we ourselves know, to the work of others and we should like to mention particularly two Reports to which we have given great attention, namely : The Report (1938) to the Board of Education for England and Wales on “ Children with Defective Hearing ” ; and The Report (1949) of the Advisory Council on Education in Scotland on “ Pupils who are Defective in Hearing ”.

At an early stage of our deliberations we realised that our subject required a highly specialised vocabulary and therefore we have provided Appendix II which deals with common terms in the physics, physiology and psychology of sound, hearing and deafness. We have also provided Appendix III on tests and test procedures commonly in use.